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CAMPIODOL (IODIZED RAPESEED OIL)

ITS USE IN THE ROENTGENOGRAPHIC VISUALIZATION OF THE BODY CAVITIES*

A Clinical and Experimental Study

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IN order to more accurately visualize the cerebrospinal system, Frazier and Glaser, with the aid of Dr. George Raiziss, investigated radiopaque substances experimentally, with the resulting synthesis of campiodol, iodized rapeseed oil. It soon became apparent that no fully saturated iodized oil would give maximum visualization in all the body cavities because of non-miscibility, great viscosity and extreme opacity. For this reason special products of campiodol were synthesized for the various body cavities. This resulted in a greater accuracy of diagnosis, a perfection which heretofore had never been reached by any other iodized oil. In this paper, the use of campiodol and its modification products in the various body cavities will be considered.

HISTORY

The history of opaque substances began with the work of Tuffier (1896) who first used an opaque ureteral catheter. In 1901 Schmidt and Kolisher again, independently, described a similar catheter. Weil and Kienböck (1902) used freshly precipitated lead sulphate to outline the maxillary sinuses. They called attention to a thickening of the mucous membrane and concluded that variations in this thickening was indicative of the course of the disease. Because of the toxicity of lead sulphate and the fact that it had to be washed out of the antrum, this method did not gain great prominence. In the succeeding years, Klose introduced the barium and bismuth meal for outlining the alimentary tract; Voelcker and von Lichtenberg (1906) utilized collargol, a colloidal silver compound, for the first successful mapping of the urinary tract; Boeck (1908) introduced bismuth paste for the visualization of fistulae; and finally, in 1915, Burns introduced thorium nitrate, an electrolyte, for pyelography. Due to the toxicity of thorium nitrate it was discarded, and it was not until 1919 with the introduction of sodium iodide by Cameron and Wells that pyelography became a universal procedure. In 1918 Chevalier Jackson was the first to outline the tracheobronchial tree by the insufflation of bismuth subcarbonate by means of a bronchoscope. During the same year, Stewart and Lynah suggested emulsions of bismuth with olive oil for a similar purpose. In 1921 Sicard and Forestier introduced lipiodol. This was followed by a period of more accurate visualization of many of the body cavities which hereto-

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fore could not be clearly outlined. In 1924, the outstanding contribution of Graham and his coworkers, the introduction of tetraiodophenolphthalein for gall-bladder visualization, opened a new means of roentgenographic exploration, that is, by means of the specific selectivity of the organs of the body for a chemical substance. In 1929, Binz, Räth, Swick and von Lichtenberg introduced uroselectan for intravenous urography.

EXPERIMENTAL STUDIES

In the search of the most ideal roentgenographic opaque substance for cerebrospinal visualization, attention was first directed to the discovery of the most satisfactory element. In the selection of elements the choice depends upon its ability to cast a shadow upon a roentgen plate, its ability to combine readily with other substances, the solubility and toxicity. After a trial of some thirteen elements, among which were barium, bismuth, bromine, silicon, tungsten, strontium, lead, iron, copper, silver, gold, platinum and iodine, it was found that iodine was the most satisfactory.

In an effort to determine the best inorganic or organic compound numerous products were synthesized, such as iodides, iodates, periodates, iodophenolphthaleins, iodized fluoresceins and iodized oleic, benzoic, quinoline and thymol compounds. None of these were satisfactory because of their toxicity produced upon subarachnoid injection in dogs. For this reason attention was diverted to iodized oils.

The ability of certain oils to combine with iodine depends upon the presence in them of unsaturated fatty acids. In such unsaturated oils iodine is held in firm union. Deterioration of the final product depends upon the method of chemical preparation. If there is an excess of free iodine in the final product, increased toxicity occurs. Dark products resulting from the splitting off of iodine are considerably more toxic than the light transparent ones. Oils of low specific gravity, high iodine value, and low viscosity were selected. First, fish oils were utilized, and cod liver oil, meeting the above prerequisites, was deemed particularly adaptable because of its rapid absorption by the human body. This was converted into an iodo compound containing 55 per cent iodine. This product, however, gradually became dark, cloudy and ultimately turned black; menhaden oil acted similarly; sweet almond oil proved unstable. All these oils, upon subarachnoid injection, proved extremely irritating (Fig. 1). With rapeseed oil a

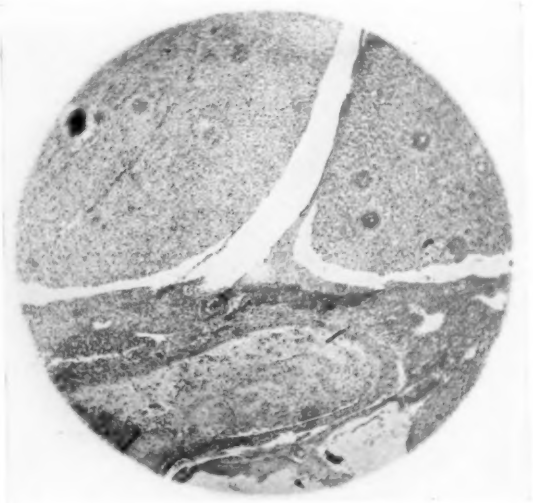

Fig. 1. Sweet almond oil injected into the subarachnoid space of a dog (No. 283), with death ten days postoperative. In this section there is a subarachnoid accumulation of polymorphonuclear cells. Meningitis is very evident. Congested vessels are visible. There is no invasion of cord substance. (57X.) (N. H. Winkelman.)

product was finally obtained which proved well suited in all details for our work.

Rapeseed oil, also known as colza oil, is a vegetable oil, of brownish yellow color, and is obtained from *Brassica napus*, *Brassica campestris* and *Brassica rapa*, all belonging to the family Cruciferae. To this same family belong white and black mustard. Rapeseed oil is composed of the glycerides of stearic, erucic and oleic acids. It is employed as an edible oil and for various industrial purposes. Its specific gravity is about 0.914. The saponifica-

tion value ranges from 167 to 178, and the iodine value from 93.5 to 105.6; its viscosity is 250 at 100° F. Upon iodization a light yellowish product (campiodol) is obtained, with a specific gravity of 1.289. This product deteriorates very slowly when exposed to light or heat, and upon roentgenographic exposure an intense shadow is obtained, so much so that dilution products may readily be made without destroying its clinical value.

Campiodol is only slightly irritating and is of low toxicity. Dogs have withstood an oral dose of 6.75 c.c. per kilogram of body weight. On injection of 1.5 c.c. per kilogram of body weight into the internal carotid artery with the external carotid ligated, no toxic effects were noted. In dogs weighing 4 to 6 kilograms 4 to 6 c.c. have been injected by cisternal punctures into the subarachnoid space without toxic effects. Spinal fluid cell counts on dogs in which 2 c.c. of the iodized oil had been injected into the spinal subarachnoid space varied from 250 to 800 cells per cubic millimeter. At the end of five or six days, the cell count ranged between 5 and 15 cells per cubic millimeter. No clinical effects were noted. In clinical cases of hydrocephalus, 7 c.c. of the oil was injected into the ventricles with a maximum count of 310 cells per cubic millimeter on the second day. In another clinical case 3.5 c.c. was injected into the ventricles with a maximum count of 19 cells per cubic millimeter three days after injection. Emulsified campiodol has been used without toxic effects in 250 pyelograms. As high as 125 c.c. of the emulsified product was utilized in a patient with hydro-ureter and hydronephrosis. Fifty per cent campiodol has been used in 40 cases of chronic maxillary sinusitis without any toxic effect. Straight campiodol has been used in 200 injections of the tracheobronchial tree without toxic effects. From these figures we may conclude that campiodol has extremely slight irritating qualities and though it produced some cellular reaction, this was of a very low degree.

To demonstrate spinal block for ventricular visualization, to outline sinuses and to outline blood vessels, lacrymal ducts, mastoids, eustachian tubes, fistulae, and in experimental work, particularly when an oil of low viscosity is of value because of ease in injection and greater fluidity, a diluted compound has been prepared. Experimenting with liquid petrolatum, olive oil, uniodized rapeseed oil, and finally ethyl olive oil, it was found that liquid petrolatum proved irritating; olive oil greatly increased the toxicity, and uniodized rapeseed oil gave a product with a viscosity slightly greater than could be obtained with ethyl olive oil. Ethyl olive oil was an ideal product because of its low specific gravity—0.867. In this manner a large amount of iodine shadow-casting properties is maintained in the final solution. Ethyl olive oil was prepared by Professor Roger Adams and Dr. E. H. Volwiler. It presents a mixture of the ethyl esters of the acids present in olive oil. It is prepared as follows: A mixture of olive oil, absolute ethyl alcohol and concentrated sulphuric acid is refluxed for four hours. The alcohol solution of ethyl esters formed is washed with 10 volumes of water. The esters are separated and dried with anhydrous sodium sulphate. If any ethyl alcohol is present, it is distilled off. The oil in this way is then further purified by distillation in vacuo (65 mm.) at temperatures ranging from 190 to 225° C.

By mixing four parts of campiodol with one part of ethyl olive oil, a fluent product was obtained with the specific gravity of 1.004. It is this oil that we recommend for use in the subarachnoid space, for arterial use, fistulae, mastoids, eustachian tubes, and outline of the female genitalia. The shadow it casts is entirely satisfactory and the oil can be readily injected. Dilution with ethyl olive oil does not increase the toxicity and tends to protect campiodol from deterioration.

In the outline of the nasal sinuses, an oil casting too great a shadow will not show all the details that are essential. The

minute details desired are clearly visualized by a mixture of 50 per cent ethyl olive oil and 50 per cent iodized rapeseed oil. This oil can be readily injected and drains satisfactorily from the sinus.

In order to emulsify campiodol, such agents as gelatine, tragacanth and acacia were utilized. It was found that acacia was the most desirable. The synthesis of campiodol and the emulsion are discussed in a separate paper (Glaser and Raiziss).

The use of campiodol and its modification products will be considered in the following body cavities.

1. Tracheobronchial tree (straight campiodol)
2. Subarachnoid space (4 to 1 dilution)
   a. Spinal block
   b. Ventricular visualization
3. Blood vessels (4 to 1 dilution)

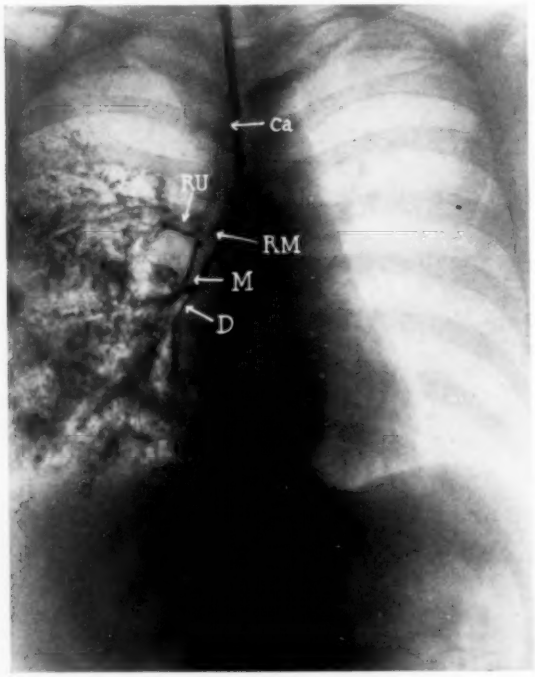

Fig. 2. The right lung is outlined with campiodol, but except for a narrowing between the middle and lower lobe bronchi, the plate is normal. Ca, catheter in the trachea; RM, right main bronchus; RU, right upper lobe bronchus; M, continuation of the right main bronchus below the upper lobe bronchus; D, point of division between the middle and lower lobe bronchi.

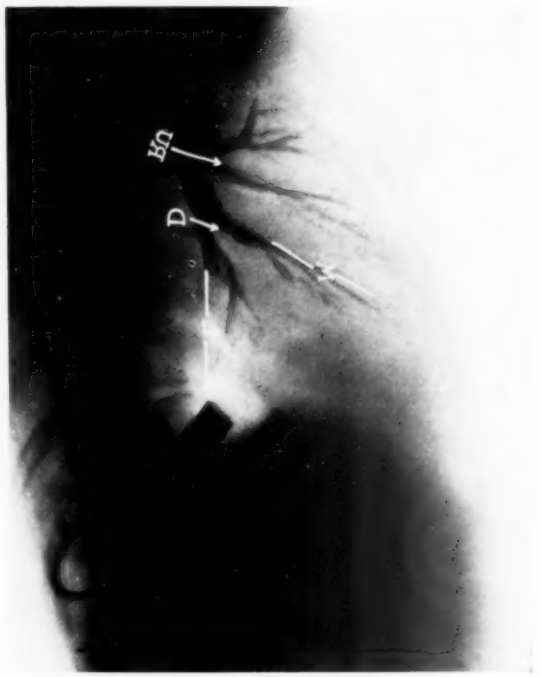

Fig. 3. Right-sided empyema which has so compressed the lung that the campiodol has been confined to the tracheobronchial tree. RU, right upper lobe bronchus; M, middle lobe bronchus; L, lower lobe bronchus; D, point of division between the middle and lower lobes.

   a. Cerebral
   b. Peripheral
4. Fistulae (4 to 1 dilution)
5. Maxillary sinus (50 per cent)
6. Genitourinary tract (emulsion)
   a. Kidney pelvis
   b. Bladder
   c. Ureter
   d. Urethera
7. In addition, the oil may be used to outline the female genitalia, the sphenoidal sinus, frontal sinus, the lacrymal ducts, the mastoids and the eustachian tubes.

VISUALIZATION OF THE TRACHEOBRONCHIAL TREE

Campiodol is of great value in clearing up obscure chest conditions, particularly when patients complain of persistent cough, expectoration, hemoptysis or chest pains in the absence of tubercle bacilli. It is contraindicated only in those cases

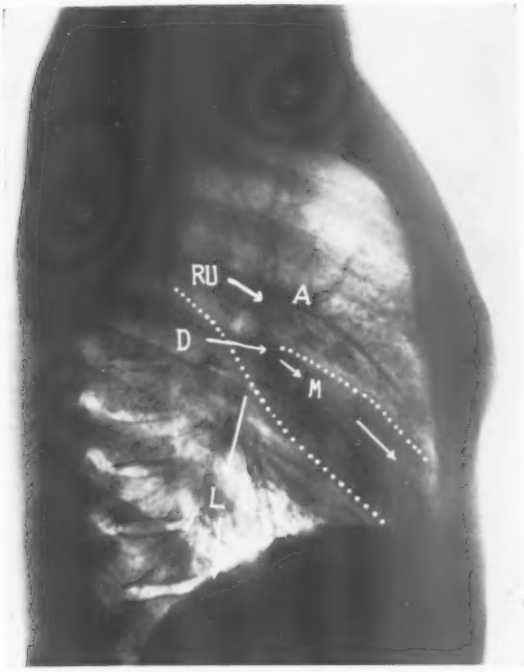

Fig. 4. Lateral view of the right lung showing the anterior direction of the middle lobe bronchus, M, and the posterior direction of the lower lobe bronchus, L. RU, right upper lobe bronchus; A, anterior branches of the upper lobe bronchus; D, point of division between the middle and lower lobe bronchi. The dotted lines indicate the division of the right lung into the upper, lower and middle lobes.

where the oil will lower the vital capacity below that of safety. Campiodol has not as yet been used in tuberculosis.

Since the introduction of iodized oil, many methods of injection have been employed by the various workers, all of which are of value and may be utilized in selected cases. It has been the experience of Dr. W. B. Faulkner, Jr., to have had more consistent results with the catheter method. Campiodol is introduced under the roentgenoscope. In this manner, the flow can be visualized. Roentgenograms are taken immediately. In certain cases where pus, foreign bodies or tumors occlude a bronchus, preliminary bronchoscopy must be carried out so that the intrabronchial obstruction is removed and a clear pathway is established for the entrance of the oil. In order to accurately diagnose lung pathology, it is extremely important to visualize the normal tracheobronchial tree (Figs. 2, 3 and 4).

In the diagnosis of bronchiectasis, the use of campiodol is of paramount importance. Bronchiectasis may be classified by the shape of the diseased bronchi, such as fusiform, cylindrical and saccular. All of these forms may exist in the same patient. More important than this classification is the determination of the extent and location of the bronchiectatic process (Figs. 5 and 6).

Bronchostenosis may be divided into three types: inflammation, bronchial tumors and intrapulmonary tumors. In all of these cases, if the bronchi are completely obstructed, preliminary bronchoscopy is necessary (Fig. 7).

In empyema the use of campiodol should be limited to those cases where the physical signs and roentgen findings do not give conclusive evidence as to the extent

Fig. 5. Campiodol injection of the right lung in a patient who has had a partial lower posterior thoracoplasty. The arrows point to large dilated fusiform bronchi at the base of the right upper lobe. The bronchi of the lower lobe are normal.

of lung expansion on the diseased side. If the lung is not fully expanded, further treatment is necessary, particularly in those cases where closed drainage has been carried out.

Acute lung abscess can only be visualized if the bronchus leading to the abscess is not obstructed. If this bronchus is obstructed by pus, granulation tissue, or edema, preliminary bronchoscopic treatment is needed in order to clear the passage way. Campiodol should then be injected immediately. Chronic abscesses are more readily filled.

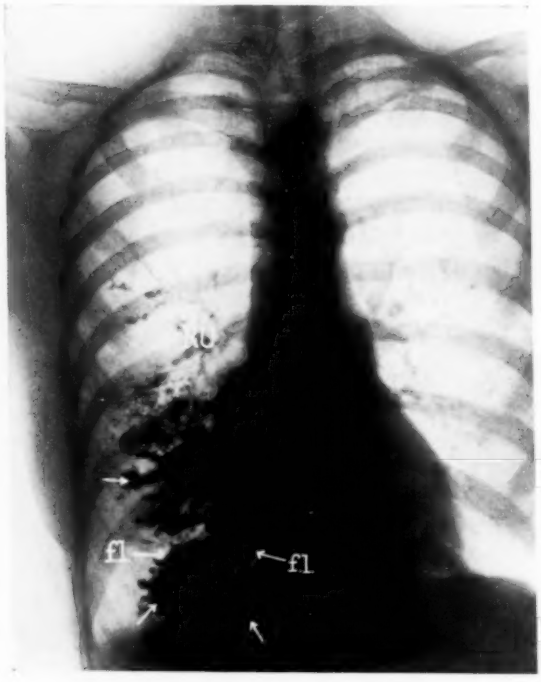

Fig. 6. Campiodol injection of the right lung. Note the dilated bronchi at the right base. RU, right upper lobe bronchi. The arrows indicate the bronchiectatic areas in the middle and lower lobes; f.l., fluid levels in the dilated bronchi.

In cases of pleural pulmonary fistulae intratracheal injection of campiodol will show collections of oil in the pleural cavity. External pleural cutaneous sinuses connecting with the lung through a bronchial fistula are readily recognized by campiodol injection (Fig. 8).

Fig. 7. Diffuse primary carcinoma of the lung with hydropneumothorax as well as atelectasis of the lower lobe. Diagnosis confirmed at autopsy.

Fig. 8. The campiodol has extended from the empyema pocket into the bronchi, indicating a bronchial fistula.

Fig. 9. Campiodol visualizing the subarachnoid space of a dog.

In some cases of lung disease a definite therapeutic value was noted, while in other cases no definite improvement occurred. The rôle, however, of campiodol as well as that of other iodized oils is more diagnostic than therapeutic.

This work on the use of campiodol in thoracic disease has been carried out by Dr. Wm. B. Faulkner, Jr., of the University of California. This subject will be considered more fully in a separate paper.

SPINAL SUBARACHNOID SPACE AND VENTRICLES

It is the general consensus of opinion that in certain specified cases of spinal cord disease an iodized oil is of value for the localization of level lesions. Campiodol should not be used haphazardly nor as a routine, but should only be used in conjunction with neurological findings and the jugular compression test. Campiodol in 4 to 1 dilution is of sufficiently low viscosity to be readily injected into the spinal subarachnoid space without special syringes; it flows easily up and down the spinal subarchnoid space with change of position of the body, globulates only slightly and rarely becomes adherent to nerve

Fig. 10. Campiodol visualizing the subarachnoid space of a dog.

roots. This practically eliminates the occurrence of a false block.

It is the belief of many neurological surgeons that all level lesions should be subjected to surgery so as to eliminate the presence of tumor. Spinal level lesions may be caused by numerous cord diseases, such as multiple sclerosis, myelitis, meningomyelitis, etc. For this reason many patients are subjected to laminectomy uselessly, and in some cases their symptoms are accentuated (Sachs and Glaser). When these diseases of the spinal cord produce meningeal adhesions, campiodol will show a spinal block similar to that shown by cord tumor and will not aid in the differential diagnosis.

Campiodol may be injected into the cisterna, or the lumbar subarachnoid space. The flow of the oil should then be observed under a roentgenoscope, tipping the patient up or down. In this manner any slight constriction of the globule of oil may readily be noted, provided no definite block is apparent (Frazier and Glaser).

Iodized rapeseed oil should be utilized only in those cases where a level lesion is present and the jugular compression test demonstrates the absence of a spinal block, or conversely in those cases where a definite level lesion is absent and the jugular compression test demonstrates a partial or complete block. In suspected cases of tumor of the cauda equina, campiodol is of value in the diagnosis.

FIG. 11. Note the circular appearance of the globule of campiodol in a normal subarachnoid space.

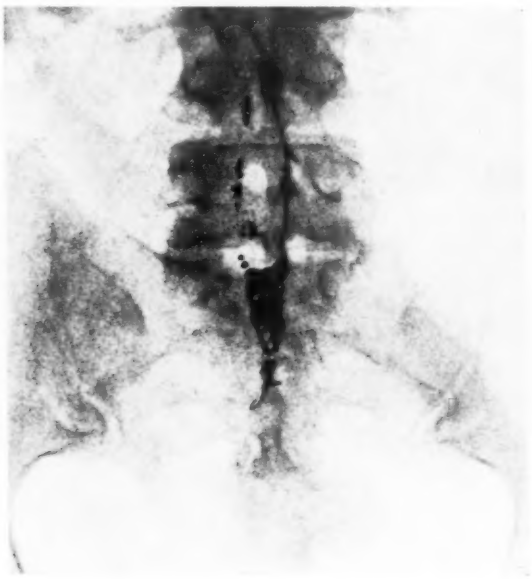

FIG. 12. There is a partial block opposite the lower lumbar vertebrae.

This oil remains in the spinal subarachnoid space for a long period of time. At first a slight cellular reaction occurs, though from a clinical standpoint no symptoms arise. For this reason *it cannot be too greatly emphasized that campiodol should only be used when every other means of diagnosis has been exhausted* (Figs. 9, 10, 11 and 12).

The outline of the ventricles by means of an iodized oil was first attempted by Forestier and Sicard. They mixed a quantity of ascending lipiodol with spinal fluid and injected it into the spinal subarachnoid space by lumbar puncture. The emulsion of oil and spinal fluid ascended into the ventricles and when the emulsion broke, minute globules of oil settled along the ventricular wall giving a distinct outline. They reported a death from this procedure and numerous violent reactions.

This emulsification of an ascending oil was tried with campiodol. A violent reaction resulted with a rise of temperature to 105° F. For this reason it is not advisable

Fig. 13. Demonstration of an intraventricular tumor after the injection of 2 c.c. of iodized oil into the ventricles (4 to 1 dilution). Note the two air bubbles in the upper portion of the lateral ventricles.

to outline the ventricles by an ascending oil emulsion. If campiodol with a specific gravity slightly greater than that of spinal fluid is injected directly into the ventricles,

Fig. 14. The cerebral vessels of a dog's head are visualized after the injection of 5 c.c. of campiodol into the internal carotid artery.

a faint outline may be observed. This method succeeded in outlining a ventricular tumor (Fig. 13). Further researches must be carried on before this use of campiodol can be of clinical importance.

The cerebral vascular system has been outlined by intracarotid injection with ligations of the external carotid. As yet, this has been utilized only in animals, but no toxic effects have been noted (Fig. 14). Egas Moniz has utilized sodium iodide by a similar method and has succeeded in diagnosing brain tumors. Further work must be carried out upon this method of cerebral localization.

Fig. 15. The arteries in the hind leg of a dog are visualized after a femoral injection of 4 c.c. campiodol (4 to 1 dilution).

The peripheral vasculature may also be outlined by campiodol, 4 to 1 dilution. This is of value for the diagnosis of arterial obstruction and in experimental work (Fig. 15).

FISTULAE

Various body fistulae and abscesses may be readily outlined by the utilization of a 4 to 1 dilution (Fig. 16 and 17).

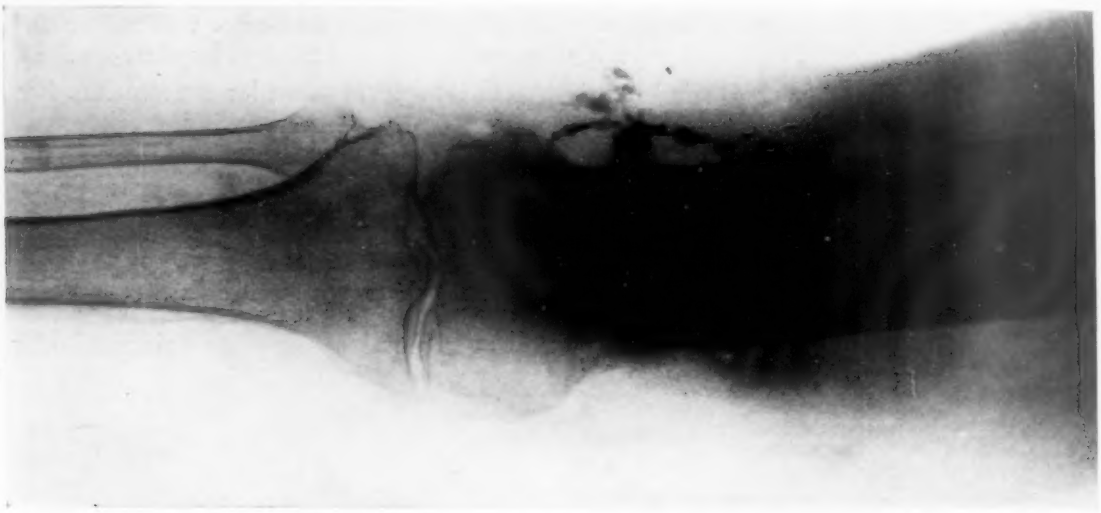

Fig. 16. The visualization of a sinus in a case of osteomyelitis.

MAXILLARY SINUS

Fifty per cent campiodol has proved the most satisfactory for the outline of the maxillary sinus. The low viscosity enables the oil to be injected without special syringes and also allows a shift of the oil in the sinus with change of position. This gives an outline of all the sides of the sinus wall. Due to the diminished shadow casting property, the essential soft tissue details which must be clearly outlined are not obscured.

Fig. 17. A fistula in the lumbar region clearly visualized.

The maxillary sinus has various forms of pathology which must be accurately ascertained. The presence of pus, with or without thickening of the mucosa, chronic maxillary sinusitis with great thickening of the walls, or polypoid formation, dentigerous cysts, sarcoma, mucocele, etc., are among the more common pathological entities. In addition, there are abnormalities of the normal sinus, such as thickening of the wall, or undeveloped sinuses. In the young, before the sinuses are properly developed, the detail may be blurred by unerupted teeth, and in adults the density of the bone may be increased to such an extent as to be misinterpreted as sinus disease.

Clinical and roentgenographic evidence frequently fails to make the diagnosis accurately. By the use of campiodol, the exact thickness of the mucous membrane may be determined (Fig. 18), polyps may be diagnosed (Fig. 19), etc. In some cases where the mucous membrane is normal or slightly thickened, medical treatment will suffice, whereas in other cases where the mucous membrane is greatly thickened,

Fig. 18. Campiodol injection of both antra shows the wall of the right antrum thickened to about 8 mm., and the wall of the left antrum to be about 3 mm.

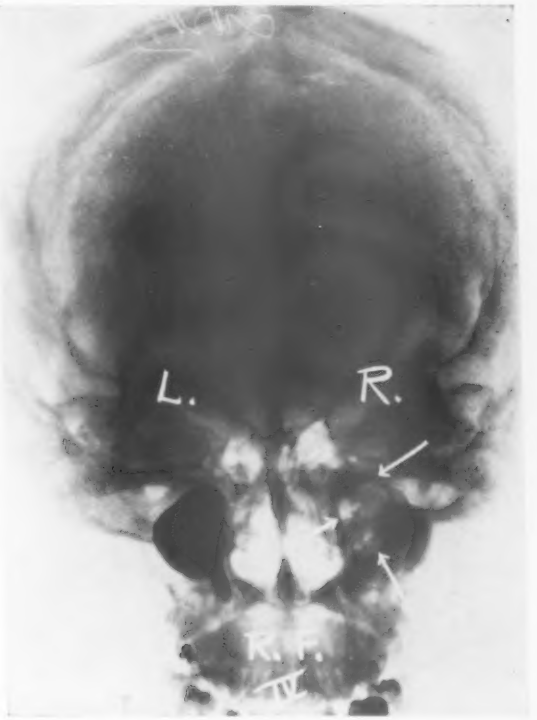

Fig. 19. The mucous membrane of the right antrum is 4 mm. thick with a polyp in the antronasal wall. The mucous membrane of the left antrum is about 3 mm. thick.

surgery is necessary. In order to gain the best visualization of the maxillary antrum, Glaser, Futch and Snure described a technique, with illustrations, by which the various sinus walls may be visualized. This will not be described in this paper, but it is sufficient to say that prone Waters, prone Granger, supine and prone lateral views were utilized with stereo Waters and supine laterals. The frontal sinus (Fig. 20) and the sphenoidal sinuses may also be outlined.

UROGRAPHY

Iodized oils, though casting satisfactory shadows, gained little favor in urography because of their increased viscosity and non-miscibility. The viscosity of these oils did not permit a ready flow into the kidney pelvis, unless special syringes were used and great pressure exerted. Adherence to the pelvic and ureteral mucous membranes prevented ready drainage and frequently resulted in obstruction with consequent pain. Air, accidentally introduced, might produce a trap with a similar

Fig. 20. A normal frontal sinus is outlined. (Injection by Dr. H. J. Hara.)

Fig. 21. Bilateral normal pyelogram.

result. The non-miscibility often gave distorted pyelograms hindering correct diagnosis.

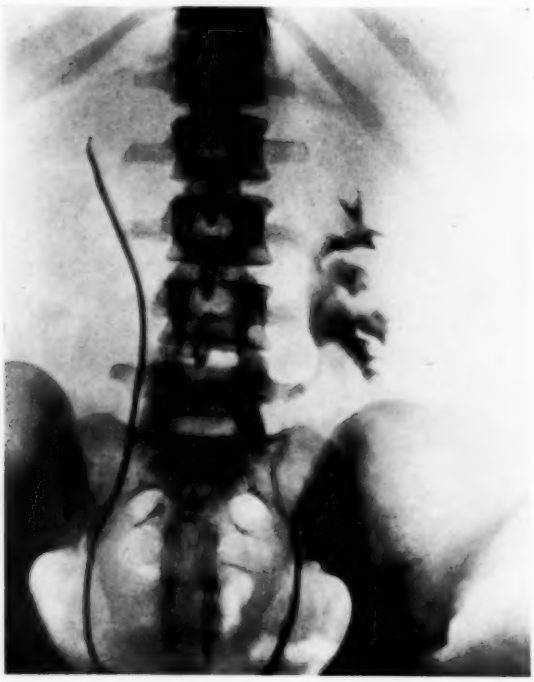

Fig. 22. Normal pyelogram.

Twelve and one-half per cent sodium iodide is quite satisfactory as a pyelographic medium, but as it is an electrolyte it irritates the mucous membrane, in many instances causing severe pain.

Uroselectan introduced for intravenous urography has a limited field of usefulness since in cases with poor kidney function the visual results are correspondingly affected and frequently the density of the excreted substance is insufficient for proper visualization.

Emulsified campiodol is a grayish white

Fig. 23. A carcinoma of the right kidney.

substance, with a specific gravity of 1.078, and a viscosity of slightly more than twice that of water; it is non-irritating, nontoxic, and casts excellent shadows. By its use pain, burning and other signs of discomfort have been eliminated. It has been used successfully in over 300 cases (Glaser and Kutzmann, Kutzmann), giving satisfactory pyelograms, ureterograms, cystograms and urethrograms. As this emulsion is miscible with water, it is able to gain access into all the crevices, or openings in the urinary tract, giving exact

definition of the calyces, pelvis, ureter, even the papillae in the minor calyces being clearly outlined in detail. The slight viscousness of campiodol prevents reflux into the bladder as so frequently occurs with sodium iodide. This gives a good ureteral outline and eliminates bladder irritation.

The syringe method has been used because the emulsion is as yet slightly viscous for the gravity method; however, excellent pyelograms have been obtained by the gravity method with a 10 F. uretral catheter in place. The complaint of any

Fig. 24. A cystogram showing a trabeculated bladder.

pain or discomfort by the patient in the kidney or ureteral region is the signal for the cessation of injection. Further experimentation will be carried out to determine whether the emulsion cannot be made more adaptable to the gravity method (Figs. 21, 22, 23, 24, 25 and 26).

CONCLUSIONS

1. Iodized rapeseed oil, campiodol, is a stable, non-toxic oil containing approximately 43 per cent elemental iodine.

Fig. 25. A diverticulum of the bladder in the same case as Figure 24.

2. Straight iodized rapeseed oil is satisfactory for the outlining of the tracheobronchial tree.

Fig. 26. A normal urethrogram.

3. A 4 to 1 dilution with ethyl olive oil is satisfactory for outlining the spinal subarachnoid space, cerebral and peripheral blood vessels, the female genitalia, the lacrymal ducts, the mastoids and the eustachian tubes.

4. A 50 per cent dilution with ethyl olive oil is satisfactory for outlining nasal sinuses.

5. Emulsified campidol is an inert, non-irritating substance and has been successful in urography, with a minimum of irritative symptoms.*

* Thanks are extended to Drs. H. K. Pancoast and E. P. Pendergrass of the University of Pennsylvania for their kind cooperation in the original research.

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MIKULICZ'S DISEASE AND THE MIKULICZ SYNDROME

THEIR TREATMENT BY IRRADIATION

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HISTORY AND CLASSIFICATION

IN JANUARY, 1888, Mikulicz[114] presented before the Society of Scientific Medicine of Königsberg a man forty-two years of age, who had a symmetrical enlargement of the lacrymal and salivary glands. The minutes of the meeting established briefly that "both lacrymal and all salivary glands were symmetrically tumefied, resulting in marked swelling of these organs and considerable disfiguration of the face. The tumefactions developed gradually and they were at the time of the examination of hard consistency, painless, and without any manifestation of an inflammatory reaction. No other pathological change could be demonstrated in the patient affected with these tumors." Although Mikulicz, at that time, did not attempt to interpret the findings in his case, it is clear that he was dealing with an entirely new condition for which he could find no analogy in the literature and which has since been named "Mikulicz's disease" in his honor.

Shortly after this first communication, new reports appeared by Haltenhoff,[69] Fuchs,[59] Zirm,[189] and de Wecker and Masselon,[181] all emphasizing the bilateral symmetrical character of the lesion and the simultaneous involvement of the lacrymal and one or more pair of the salivary glands.

In 1892, Mikulicz[114] described in detail the chief characteristics of the disease, which he now considered a distinct clinical and pathological entity. He stated that the point of attack is most probably through the lacrymal glands, which occasionally, as in the case of Arnold and Becker,[5] may appear to be the only organ involved. When the disease is fully developed, there is evidence of a hyperplasia of the lymphadenoid tissues of the affected organs, probably due to a chronic infection. One of the important criteria of the lesion is that "the process remains localized exclusively to the lacrymal and salivary glands and that there is no extension, either to the neighborhood or to other organs and tissues." This, as we shall see, is still the main factor differentiating Mikulicz's disease proper from the so-called Mikulicz syndrome which was established later. For the same reason Mikulicz rejected the cases of Reymond[144] and Adler,[3] in which there was evidence of concomitant enlargement of the lymph nodes and spleen, as not belonging to the entity considered by himself typical of the disease proper.

Following Mikulicz's publication, numerous individual case reports appeared in the literature. Some of these cases (Snell,[166] Debierre,[38] Laffolley,[96] Jayle,[85] Küttner,[94] Kümmel,[93] Baas,[12] Cheinisse,[25] Meller,[108] Tietze,[175], and others) were considered as true forms of Mikulicz's disease, but other cases (Cutler,[34] Haeckel,[66] Marcuse,[103] v. Duyse,[41], and others) because of the simultaneous involvement of the lymph nodes and spleen, were classified as aleucemic stages of pseudoleucemia and again other cases (Gallasch,[60] Dunn[39]) were placed in the group of true lymphatic leucemia.

v. Brunn,[22] in 1906, attempted to classify the variations of Mikulicz's disease on an anatomic basis. Thus he distinguished between two main groups: those without blood changes and those with blood changes. Those without blood changes are localized to the lacrymal and salivary glands alone or there may be a concomitant involvement of the lymph nodes and spleen. The forms with blood changes may consist in lymphatic

pseudoleucemia with severe anemia,[22] or they may represent true lymphatic leucemia.[60,39] Those types with involvement of only one pair of glands, as, for example, the lacrymal glands (cases of Arnold and Becker,[5] Power,[136], Abadie,[1] de Lapersonne,[98] Pick,[128] Stoewer,[169] Shoemaker,[160] and others), or the salivary glands (Kümmel[93]) alone, are also placed in the group of Mikulicz's disease proper.

Howard[82] after making a detailed critical study of all cases recorded up to his time (1909), arrived at the conclusion that Mikulicz's disease is not an entity but merely a syndrome. Thus he says: "The weight of evidence is in favor of the contention that Mikulicz's disease is merely a clinical syndrome very much as are tetany, epilepsy, etc. For in the literature there are cases illustrating all stages of gradation between the strict Mikulicz type and the most characteristic leukaemia. Furthermore, some cases reported as Mikulicz's disease have later in their course been classified as pseudoleukaemia (Marcuse's case[103]); and others considered pseudoleukaemia have before death proved to be very chronic cases of leukaemia (Stock's case[168])." For purposes of convenience, Howard grouped the cases collected from the literature under three heads: (1) Mikulicz's disease proper; (2) pseudoleucemia, and (3) leucemia. Like v. Brunn, he included under the head of Mikulicz's disease proper, the latent forms (formes frustes) of Mikulicz's disease, that is, forms involving either the lacrymal glands (same cases as v. Brunn; also a case of v. Reuss[143]) or any pair of the salivary glands alone, as, for instance, the parotids (cases of Laffolley,[96] Kümmel,[93] Quinke,[138] Minelli,[115] and Apert[4]), the submaxillaries (Kümmel[93]) and sublinguals (Reinbach,[142] Concetti,[30] and others).

As simple as this classification of Howard may appear, it has the disadvantage that it does not cover all the conditions which might produce the so-called Mikulicz syndrome. Thus soon after the publication of Howard's work, a number of articles appeared—especially from the French and more recently from South American sources—which emphasized the part of syphilis in the production of the syndrome. Then other investigators found that tuberculosis, chronic absorption of toxins (Zeigler[188]), gout, and certain tumors such as lymphosarcoma, lymphangioma (Hagenbach[68]), carcinoma (Smith and Bump[164]), and subfacial lipomas (Koettnitz[89] and Hofmeister[80]), may lead to a picture similar to that originally described by Mikulicz. Finally it was observed that physiologic hypertrophy of the lacrymal or salivary glands (Jayle,[85] Frenkel,[55] Sarda[151]), familial or hereditary tendencies and the so-called uveoparotid fever may also play a part in the production of the syndrome.

For this reason, Thursfield,[174] in 1913, elaborated a classification which would include all lesions showing a symmetrical enlargement of the lacrymal and salivary glands. Thus he established eight groups: (1) congenital, familial and hereditary condition; (2) Mikulicz's disease proper; (3) Mikulicz's disease with involvement of the lymphatic apparatus; (4) leucemia; (5) tuberculosis; (6) syphilis; (7) gout, and (8) sialodochitis fibrinosa. This classification, although more complete than any previously mentioned, still has the disadvantage that it fails to coördinate the various conditions leading to the Mikulicz syndrome according to their incidence and importance. Therefore, Schaffer and Jacobsen[155] more recently classified the syndrome "in much the same fashion as has been done for purpuras, by dividing them into two large groups, a symptomatic and idiopathic, as follows:

I. Mikulicz's Disease
   - A. Familial
   - B. Mikulicz's disease proper

II. Mikulicz's Syndrome
   - A. Leucemia
   - B. Tuberculosis
   - C. Syphilis
   - D. Lymphosarcoma
   - E. Toxic

1. Lead
2. Iodides, etc.

F. Gout (?)

G. "Febris uveoparotidea subchronica."

The "syndrome" nature of Mikulicz's disease was emphasized more recently also by v. Hase,[74] Fromowicz,[58] Stoppato,[170] Formiggini,[53] Raybaud,[141] Daniel,[35] and others. Clarke[27] described the association of Mikulicz's disease with Erb's juvenile dystrophy, Nolan[123] with dementia praecox, Schmidt[157] with paralysis agitans and Wood[185] with Graves' disease.

REVIEW OF IRRADIATION PROCEDURES

It is only natural that the rather indefinite knowledge of the true nature of Mikulicz's disease proper, and especially as to what to include under the heading of the Mikulicz syndrome, should have led to confusion in the determination of the proper method of treatment by radiation and the estimation of the results obtained therefrom. Indeed, while in some instances the response to treatment was truly remarkable, permanent cures having not infrequently been obtained; in others, no benefit whatever could be observed from the irradiation. This is further complicated by the fact that the therapeutic application of radium, and more especially of roentgen rays, has undergone such radical changes during the past twenty-five years, that a comparison of techniques, and therefore of results, now appears practically impossible.

Still, a careful survey of the literature shows that the increase in the penetration of the rays, which was the result of gradual improvement in machines and technique, was followed by a corresponding increase in the percentage of permanent cures. It seems wise, therefore, to briefly review the most important articles reflecting the salient changes in the practical application of radiation so as to arrive at a better evaluation of the most suitable technique for the treatment of Mikulicz's disease proper and the various conditions comprising the Mikulicz syndrome.

As in the irradiation of all other diseases, radiation therapy of Mikulicz's disease was started with very soft, unfiltered roentgen rays, the time of exposure being the only factor which held the interest of the different investigators. Thus Fittig[50] (1904), Ranzi[140] (1905) and Pfeiffer[127] (1906) have treated their cases with exposures of from 42 to 360 minutes over each side of the face. In all instances there was immediate improvement, but while in the cases of Fittig and Ranzi the improvement lasted for only a few years, in the case of Pfeiffer, which received the largest amount of radiation (360 minutes on the left side and 240 minutes on the right side of the face) the improvement was permanent. It should also be mentioned that while in the cases of Fittig and Ranzi the involvement was localized to the parotid glands alone, in the case of Pfeiffer there was involvement of the parotids, lacrymal and submaxillary glands. A somewhat similar treatment was employed by van Duyse[41] (4 seances of 10 minutes each, 6 Benoist hardness, 4–5 Holzknecht units) and Haenisch[67] (7 sittings of 10 minutes each, 13 Wehnelt hardness, 20 cm. distance, Perthes' filter). In both instances there was good response to irradiation and within one to one and a half years, there was no recurrence. Similar results with nearly identical technique were reported by Freund,[56] Barjon and Lacour,[14] Lacous,[95] Simon,[163] Séjournet,[158] Duranti,[40] and Saussol,[153] the last reporting several cases of permanent cures.

With the advent of the aluminum filter, we see its gradual introduction also in the treatment of Mikulicz's disease, first in a thinness of fractions of a millimeter, later in layers of several millimeters. Thus Chuiton and Aubineau[26] employed 0.5 mm. Al (7-8 Benoist hardness, 2 ma, tint B Sabouraud), while Lüdin[101] used 2 mm. Al (125-130 Sklero hardness, ½–1 Sabouraud) as filter. Later use of increasing thicknesses of aluminum and zinc filters

and, in some instances, rather penetrating roentgen rays (up to 150 kv.) was reported by Cogolli,[28] Moorhead,[117] Hörhammer,[81] Abraham,[2] Ziegler,[187] Lintz,[100] Samaja,[150] Vallery-Radot, Gilbert, Blamoutier and Weyland,[177] Astier,[8] Wright,[186] Popp,[133] Scales,[154] Radcliffe,[139] Ross and Shepheard-Walwyn, and others. In all these instances, the irradiation led to more or less satisfactory results, not infrequently with long periods of remissions or even permanent cures.

The beneficial effect of radium which no doubt constitutes the hardest type of radiation available, was emphasized by Bartlett,[15] Pinch,[129] and especially by Hamburger and Schaffer.[70] These latter have treated a case of uveoparotid fever, which has remained well for a period of five years. A combination of roentgen rays over the salivary glands and radioactive substances over the eyes was used to advantage by Chuiton and Aubineau[26] (radium) and Marcotty[102] (mesothorium).

More recently, however, several reports have appeared in the literature as, for instance, those of Courchet,[32] Askey,[7] Schaffer and Jacobsen[155] and especially of Griffith[63], which deny the beneficial action of the roentgen rays in some forms of Mikulicz's disease. Thus Schaffer and Jacobsen write as follows of two of their cases: "While in the hospital, the patients received systematic roentgen ray exposure of the parotid glands, but without noticeable effect;" and again Griffith says: "In my own case, roentgen ray treatment was without benefit." In one of the cases of Vallery-Radot et al.[177] there was likewise no response of the affected glands to radiation.

In attempting to estimate the value of radiation in the various forms of Mikulicz's disease, we believe that due attention must be paid to the type of the lesion we have to deal with. It is quite natural to assume that Mikulicz's disease proper which *a priori* is a chronic condition of long duration, should show a more favorable response to radiation with regard to the ultimate outcome than would be the case with the Mikulicz syndrome in leucemia, generalized lymphosarcoma and some forms of very far advanced tuberculosis. In many of the above publications, which are nearly all individual case reports, sufficient distinction is not made between the different types of Mikulicz's disease regarding their response to irradiation, and consequently the conclusions arrived at are often contradictory and uncertain. This is especially true when the method of procedure and the dose applied are considered.

For this reason, we prefer to divide the cases treated by us as is done by Schaffer and Jacobsen,[155] into different groups, and thus to consider them in the light of the characteristics of that particular group, both from the pathological and therapeutic standpoint.

Our series includes 9 cases, 2 of which are pure types of Mikulicz's disease proper, 3 belong to the leucemia group, 2 are cases of tuberculosis, one a lymphosarcoma and one a Hodgkin's disease with involvement of the parotid glands.

MIKULICZ'S DISEASE PROPER

This condition consists, as originally described by Mikulicz[114], in a painless, non-inflammatory, symmetrical swelling of the lacrymal and one or more pair of the salivary glands, without involvement of the lymphatic system and without alteration of the blood. The general health of the patient is affected but little and the disease is of comparatively long duration, the average, according to Lane,[97] being seven and a half years, but cases living as long as fifteen years have been recorded. In some instances there is a secondary swelling of the upper eyelids and skin of the face, leading to a slit eye or "bloodhound eye appearance" (Ziegler[188]). Because of the involvement of the lacrymal and salivary glands, there is often a dryness of the eyes and of the mouth, sometimes accompanied by a peculiar deafness (Samaja[150]). The dryness of the eyes may lead to conjunc-

tival and corneal complications, while the dryness of the mouth may produce ulceration of the mucous membrane of the mouth and gastric disturbances.

It is interesting that intercurrent acute infections not infrequently lead to partial or complete disappearance of the enlargement of the affected glands with prompt recurrence of the enlargement as soon as the infection subsides. Thus Mikulicz[114] himself observed a reduction in the size of the glands following peritonitis, while a nearly complete disappearance of the disease was observed by Zirm[189] and Quinke[138] following erysipelas, by Kümmel[93] following pneumonia and influenza, by Guillain, Kudelski and Lieutaud[64] following encephalitis, and by Haeckel[66] following simple enteritis. In some instances, Mikulicz's disease is of the abortive type, as in the cases of Souques and Chéné,[167] Gouget,[62] de Jong and Joseph,[87] Sicard,[161] Sicard and Leblanc,[162] Méry, Girard and Mercier-Desrochettes,[111] Weissbach,[184] Sabrazès,[149] and others.

Since the etiology of Mikulicz's disease proper is unknown, great speculation arose in the literature as to the true nature of the disease. This was further complicated by the fact that the small round cells which on microscopic examination were found to invade or replace the organs affected, were variously interpreted as being due to a reactive process or to hyperplasia of the lymphoid tissue elements. The followers of the first theory (Mikulicz,[114] Hirsch,[79] Ranzi,[140] Haeckel,[66] Haenisch,[67] Külbs,[92] Portman,[134] and others) naturally assumed that the condition was a chronic inflammation, while the followers of the second theory considered it a more or less benign new growth. Of this latter group, Kümmel[93] was especially emphatic in separating Mikulicz's disease proper from all other allied conditions, and he suggested the use of the term "achroacytosis," while others advised the term "nonaggressive lymphadenoid hyperplasia."

v. Brunn[22] after observing a case of Mikulicz's disease develop into a leucemia, advanced the opinion that "the symmetrical swelling of the lacrymal and salivary glands and leucemia must have a common cause." Howard[82] in further elaborating this theory, states that "a whole series of cases exists forming links in the chain from isolated lymphomata of the lachrymal or salivary glands to complete involvement of these glands with simultaneous disease of the lymphatic and hematopoietic apparatus."

This theory, that Mikulicz's disease progresses from the disease proper—through pseudoleucemia—to the true lymphatic leucemia and that consequently, under the best conditions, it represents an "aleukemic stage of pseudoleukemia" was endorsed by a great number of investigators, such as Marcuse,[103] Krause,[91] Broeckaert,[21] Caspary,[23] Meller,[108] Pfeiffer,[127] Snegireff,[165] Voit,[179] Thaysen,[172] Lüdin,[101] Paton,[126] Hempelmann,[77] Cogolli,[28] Schmidt,[156] Fridericia,[57] Munck,[119] and others. More recently Schaffer and Jacobsen,[155] after analyzing in detail the evidence presented by the various investigators, and especially by Howard,[82] in favor of the leucemic character of Mikulicz's disease as a whole, arrived at the conclusion "that leukemia, when it does occur,—in conjunction with Mikulicz's disease—is invariably primary," and that "though every case of Mikulicz's syndrome is possibly one of leukemia, Mikulicz's disease proper is not potential leukemia." They also presented "evidence against the time honored theory of the progression of Mikulicz's disease from the disease proper, through pseudoleukemia to leukemia."

For this reason, Schaffer and Jacobsen plead for the re-establishment of Mikulicz's disease proper as a separate entity. A similar opinion is expressed by Smith and Bump,[164] who say: "There seems to be a definite group of patients, like the patient of Mikulicz's report, where disease has a long course without effect upon the general health or life of the patient, and hence, with a wholly different prognosis than

that of leucemia." The separate entity of Mikulicz's disease proper was emphasized also by Harmel,[73] Middeldorpf and Moses,[113] Dunn,[38] Aubineau,[10] Atkinson,[9] Arnst,[6] Fisher,[49] Barbick,[13] New,[122] Franke,[54] McKenzie,[107] Cooper,[31] Faure,[47] Evans,[44] and others.

From the point of view of radiation therapy, the most important criterion of Mikulicz's disease is its local histologic appearance. The lymphocytic infiltration, regardless of whether it is of a chronic inflammatory or of a benign neoplastic origin, shows a good response to irradiation. Still, if one compares this response with that of more malignant lymphocytic proliferations, a variation in degree of the radiation sensitivity is easily recognized. Thus while lymphatic leucemia, pseudoleucemia and especially lymphosarcoma rapidly disappear, one may say "melt away," following the administration of a certain dose of roentgen rays or radium, the "lymphocytic infiltration" or the "lymphadenosis" of true Mikulicz's disease shows a response which is considerably slower. This is due in the first instance to the variation in degree of differentiation of the lymphocytes in the two types of lesions, and secondly to the organized structural arrangement of the lymphocytes in Mikulicz's disease. Ewing[46] already called attention some time ago to the fact that the lymphocytes of the tonsils, for example, are "on account of their arrangement in the organized structure of the lymphnode" less sensitive to radiation than the lymphocytes of malignant neoplasms. The same observation was made by Evans and Leucutia[45] who said that "when the organized structure of the lymphnode is maintained, even in the hyperplastic processes, a heavier irradiation is necessary in order to destroy the lymphocyte, than one would expect according to observations made on the roentgen effects on lymphocytes when in the circulating state, or in neoplastic transformation." That an organized structure of the lymphocytic proliferations or invasions in the glands affected in Mikulicz's disease exists is amply proven by the investigations of v. Brunn,[22] Thaysen[172] and especially Minelli.[115]

From the point of view of technique of irradiation this, then, means that divided doses spread over a longer period are more beneficial in Mikulicz's disease than the one single massive dose as administered, for instance, in lymphosarcoma. For the same reason, the penetration and consequently the hardness of the rays is of considerably less importance. Thus we find that nearly all cases described in the literature, which were cured, received two or more series of irradiations with rays of various qualities.

In our cases, a dose of from 15 to 50 per cent S.U.D. was administered over the affected glands, and the treatment was repeated within three to eight weeks for two or three series. The quality of the roentgen rays used was: 0.13–0.14 Å (200,000 volts, 1 mm. Cu and 1 mm. Al as filters).

CASE 1. Mrs. E. B., white, aged forty-two.

History of Present Illness. Since 1919 patient had had a painless swelling in the region of both parotid glands, which for the past two years had markedly increased in size, more so on the left side than on the right. Throughout the entire course, this condition was accompanied by extreme dryness of the mouth.

In 1927, the patient developed photophobia, a burning sensation and increased lacrymation in both eyes, all of which had become more marked during the past four months.

Except for bilateral mumps when eight years of age, the past history was negative. No other member of the family had ever had a similar condition.

Physical Examination 4–18–29. The patient was a well developed and nourished adult female.

In the region of both parotid glands, there was a painless, non-imflammatory, moderately soft swelling, somewhat more pronounced on the left side (Fig. 1). There was also marked enlargement of both submaxillary glands and moderate enlargement of both lacrymal glands.

The conjunctivae were chronically inflamed, both eyes lacrymating excessively. The right

cornea showed paracentrally an oval-shaped leucoma about 1 × 1.5 mm. in size, surrounded by nebulous areas scattered throughout practically the entire anterior surface. A similar, though somewhat less extensive, condition

Fig. 1. Symmetrical enlargement of both parotid, submaxillary and lacrymal glands (Mikulicz's disease proper) of ten years' duration.

existed on the left side. In neither eye was there involvement of the iris and both anterior chambers were clear. Because of the marked corneal opacities, a satisfactory fundus examination could not be made.

The mucous membranes of the mouth were dry. The orifices of Stensen's ducts showed no inflammatory reaction about them.

There was no enlargement of any of the superficial lymph nodes. No enlargement of the spleen or liver.

Laboratory Data. Urinalysis negative. Blood count: hb, 55 per cent; red blood cells, 3,720,000; white blood cells, 5,800; polymorphonuclears, 59 per cent; lymphocytes, 27 per cent; transitionals, 9 per cent; eosinophiles, 5 per cent. Normal morphology. Bloodchemistry normal. Van den Bergh negative in both direct and indirect test. Blood fragility normal.

Clinical Diagnosis. True form of Mikulicz's disease.

Treatment: 4–18–29. Left side of face, 10 × 10 cm. field, 65 cm. skin target distance, 0.13 Å eff. wave length, 200 kv., 1 mm. Cu, 1 mm. Al as filters, water-cooled Coolidge tube, 15 ma, 40 min., 600 ma-min., 330 r, 50 per cent S.U.D.

4-19-29. Right side of face, identical technique.

Fig. 2. Same as Figure 1, following roentgen irradiation with fractional doses.

7–2–29. Marked reduction in the size of the swelling of the parotid and submaxillary glands. Condition of the eyes unchanged. At this time treatment was repeated and extended also to the eyes. The dose and technique of exposure for the face were the same as previously, while for the eyes the dose was reduced to only 20 per cent S.U.D.

8–21–29. The swelling of the face had entirely disappeared (Fig. 2), but the condition of the eyes remained the same. For this reason, treatment over the eyes was repeated, the same dose being used as on 7–2–29.

In February, 1930, the general health of the patient was good. The face was normal in appearance, except for the marked photophobia which persisted. The lesions of the eyes remained unchanged.

Comment. The case is that of a symmetrical enlargement of both parotid, submaxillary and lacrymal glands (Mikulicz's disease proper) of ten years' duration. The condition was complicated by extensive lesions of the conjunctiva and cornea.

FIG. 3. Symmetrical enlargement of both parotid glands with beginning involvement of the lacrymal glands (Mikulicz's disease proper) of about two years' duration.

FIG. 4. Same as Figure 3, following roentgen irradiation with fractional doses.

Following the administration of roentgen therapy, the enlargement of all glands affected disappeared, but the lesions of the eyes, which no doubt represented sequelae of an old chronic inflammation—probably on the same basis as the Mikulicz's disease itself—failed to heal.

CASE II. M. C., aged twelve, white, adolescent boy.

History of Present Illness. In 1927, patient first developed a bilateral enlargement of the parotid glands, which regressed spontaneously after a period of several months, although according to mother's statement, the appearance of the face never returned to normal. In September, 1929, the swelling of both parotid glands again became very pronounced, and for this reason the patient was brought to Harper Hospital for examination and treatment. At no time had there been fever, pain or tenderness. There was no history of dryness of the mouth.

Just previous to his admission to the hospital, the patient noticed some puffiness below the left eye, accompanied by moderate lacrymation.

Except for measles and whooping cough, the past history was negative.

Physical Examination 10–29–29. The patient was a moderately well-developed and nourished adolescent boy.

There was a slight puffiness below the left eye and a slight enlargement of the lacrymal glands. On either side of the face, there was a rather firm, painless, non-inflammatory swelling in the region of the parotid gland (Fig. 3). There was no involvement of the other salivary glands, no dryness of the mouth, and no inflammation around the papilla of Stensen's ducts.

There was no lymphadenopathy, and no enlargement of the spleen or liver.

Laboratory Data. Urinalysis negative except for a trace of glucose. Blood count: hb, 70 per cent; red blood cells, 3,900,000; white blood cells, 8,500; polymorphonuclears, 62 per cent; lymphocytes, 17 per cent; transitionals, 21 per cent.

Clinical Diagnosis. Bilateral, symmetrical enlargement of the parotid glands (true form of Mikulicz's disease).

Treatment: 10–29–29. Left and right side of face (2 areas) 10 × 15 cm. fields, 60 cm. skin target distance, 0.14 Å eff. wave length, 200 kv., 1 mm. Cu, 1 mm. Al, as filters, water-cooled Coolidge tube, 20 ma., 5 min., 100 ma-min., 130 r, 20 per cent S.U.D.

11–12–29. There was a slight reduction in the size of the enlarged glands. At this time the treatment was repeated including the eyes within the field of irradiation. The same dose and technique of exposure were used as on 10–29–29.

12–2–29. There was a marked reduction in the size of the enlarged glands, and the lacrymation of the left eye had practically disappeared. Treatment was repeated with the same dose and technique as previously used.

2–13–30. The condition was apparently healed. The face and eyes were normal in ap-

pearance (Fig. 4) and the patient was entirely symptom-free. The blood count was normal.

Comment. The case is that of a symmetrical enlargement of both parotid glands with beginning involvement of the lacrymal glands (Mikulicz's disease proper) of about two years' duration. Following the administration of roentgen therapy, the condition healed and all symptoms disappeared.

Since in many instances a decrease of the swelling of the affected glands was observed following the administration of iodides and arsenic (Harmel,[73] Franke,[54] Romme,[147] Egerton,[42] Olsho[124]), it is sometimes advisable to associate the use of these drugs with the roentgen therapy. If the dryness of the mouth and eyes is very pronounced, the oral administration of pilocarpine, in doses of 5 milligrams given twice daily one-half hour before meals (Vallery-Radot et al.[177]) will produce symptomatic improvement.

It has been suggested by some investigators that in Mikulicz's disease proper, a surgical removal of the lacrymal glands should be attempted since in many instances a spontaneous clearing up of the other affected glands followed such a procedure (Mikulicz,[114] Kümmel,[93] Paton,[126] Elliot and Ingram,[43] and especially Hijmans van den Bergh,[78] and others). It seems to us, however, that in view of the very satisfactory results obtained by irradiation, surgical intervention is unwarranted.

The fact should also be mentioned here that since no definite criteria exist for the accurate diagnosis of Mikulicz's disease proper, and especially since the etiology is as yet uncertain, it often happens that cases representing allied conditions and thus really belonging to the group of Mikulicz's syndrome (tuberculosis, syphilis and especially the early or aleucemic forms of leucemia) are treated as the true form of Mikulicz's disease. The later course of the lesion, however, will usually correct such an error. In a limited number of cases, the reaction to the treatment (rapid disappearance in pseudoleucemia and allied conditions, no response in syphilis, etc.) will help to substantiate the diagnosis.

The familial, congenital and hereditary forms of Mikulicz's disease are very rare and are included here only for the purpose of completeness.

Quinke[138] and Külbs[92] reported the occurrence of enlargement of the parotid glands in son, father, two uncles, five brothers and two sisters, each of whom had a "peculiar face." In the son, the enlargement regressed following intercurrent erysipelas, only to return within six weeks after the healing of the infection. Another case of inheritance occurring in two generations was reported by Leri and Gutman[99] and by Laffolley.[96] In the latter's case, the enlargement of the parotid glands was associated with repeated attacks of rheumatism and slight atheroma in both father and son. Nagel[120] observed a symmetrical enlargement of the lacrymal and parotid glands occurring in two brothers.

In certain parts of Africa a condition very similar to Mikulicz's disease occurs which has a definite familial and hereditary tendency. The condition is called "mangy" and consists in the symmetrical enlargement of the parotid glands, the other salivary or the lacrymal glands being only rarely affected. Fontoynont,[52] who made a detailed study of this peculiar disease, was able to collect 90 cases from different parts of Africa and found that in the majority of instances, the familial and hereditary nature could be clearly demonstrated. Furthermore, he found that the disease is confined to certain localities (especially Madagascar), in a manner similar to our "goiter belts", and from this he deduced that it must be the result of a low grade regional infection. The lesion is important since it may be confused with the so-called "forme fruste" of Mikulicz's disease. While we have not had the opportunity of treating a case belonging to this group, the response to radiation according to Astier[8] as a rule is prompt and complete. The

technique of exposure and dose are the same as described for Mikulicz's disease proper.

THE MIKULICZ SYNDROME

Under the heading of "the Mikulicz syndrome" we include all those "symmetrical enlargements of the lacrymal and one or more pair of the salivary glands," which are manifestations of some clinically and pathologically well-defined disease.

The most common affections leading to the Mikulicz syndrome are: (1) leucemia; (2) tuberculosis; (3) syphilis; (4) lymphosarcoma and Hodgkin's disease, and (5) uveoparotid fever.

(1) *Leucemia.* The first case of symmetrical enlargement of the lacrymal glands occurring in leucemia was reported by Gallash[60] in 1874, which was fourteen years before Mikulicz first described the condition known by his name. While from a pathological standpoint there was nothing unusual in the appearance of this case, it was described because of the peculiar localization of the leucemia to the lacrymal glands.

With the advent of the theory of the progression of Mikulicz's disease—through pseudoleucemia—to true lymphatic leucemia, several articles appeared in the literature which emphasized the possible enlargement of the lacrymal and salivary glands during the course of lymphatic leucemia (Dunn,[38] Senator,[159] Tileston,[176] Ceconi,[24] and others). Moreover, Howard,[82] Meller,[110] and Schaffer and Jacobsen[155] found that many cases described as pseudoleucemia should have been classified as true lymphatic leucemia, for in many instances careful blood counts were missing, and in others the cases were not observed for a sufficient length of time to form a true opinion as to the exact nature of the disease. Howard[82] cites the cases of v. Brunn,[22] Battle,[16] Stock,[168] Moorhead[117] and Paton[126] as examples of this. According to Howard, the cases were "first and last" chronic lymphatic leucemias, but at the time of the examination they were in an "aleukemic stage." Indeed, one sees in recent years, with improved laboratory technique and with the more systematic follow-up of the patients observed, a gradual increase in the number of publications dealing with the incidence of the Mikulicz syndrome in all types of leucemias. Hörhammer,[81], Hannema,[71] Abraham,[2] Rivarola,[145] Rodolfo,[146] Satanowsky,[152] Fernández,[48] and especially Schaffer and Jacobsen[155] and Griffith[63] described several cases of acute and chronic lymphatic leucemia, pseudoleucemia and even myeloid leucemia (Hannema[71]), which at certain stages of the disease presented symmetrical involvement of the lacrymal and salivary glands.

The radiation therapy of the Mikulicz syndrome in leucemias should be of a more generalized character than that used in Mikulicz's disease proper. Generally speaking, the procedure and technique of irradiation are the same as for leucemias without the Mikulicz syndrome, except, of course, that the affected salivary and lacrymal glands are also included in the irradiation.

CASE III. (This case is included through the courtesy of Dr. H. A. Freund.) C. O., Male, aged forty-nine, white.

History of Present Illness. The onset of the disease in this patient was rather indefinite. A swelling beneath the angle of the jaw was noticed as far back as 1909, but a swelling of the face did not occur until 1912, at which time there was also enlargement of the superficial lymph nodes of the body.

In 1915, the lacrymal glands started to increase in size, the right more than the left. This resulted in definite protrusion of the eyeballs. Except for some difficulty in swallowing and a loss of 25 pounds in weight, the rest of the history was negative. A satisfactory family history could not be obtained.

Physical Examination 3-16-16. The patient was a moderately well-developed and nourished adult male. In the region of both parotid glands, there was a painless, moderately soft but non-fluctuating swelling, extending well up on the side of the face and downward about the angle of the jaw.

There was symmetrical enlargement of the submaxillary, sublingual and lacrymal glands. There was also bilateral injection of the scleral vessels. The mucous membranes of the mouth were very dry.

There was marked enlargement of the lymph nodes of the left cervical, axillary and inguinal regions. Roentgenograms of the chest showed a shadow about the size of a hen's egg, occupying the region of the left hilus. There was marked enlargement of the spleen and liver, and several tumor masses could be palpated in the abdomen.

Laboratory Data. Urinalysis negative. Blood count: red blood cells, 4,500,000; white blood cells, 8,700; polymorphonuclears, 71 per cent; small lymphocytes, 6 per cent; large lymphocytes, 16 per cent; eosinophiles, 2 per cent; basophiles, 3 per cent; transitionals, 2 per cent. Blood Wassermann negative.

Biopsy Report of Inguinal Lymph Node: Aleucemic lymphocytoma.

Course of the Disease. The patient was hospitalized from March 15, 1916, to May 29, 1916. During this time he received several superficial roentgen treatments administered over the affected salivary glands and some of the lymph glands with satisfactory improvement. On May 18, 1916, the patient suddenly developed pneumonia and died on June 29, 1916.

Post-mortem Examination. There was bilateral enlargement of the lacrymal, parotid, submaxillary and sublingual glands.

There was enlargement of the cervical, axillary and inguinal lymph nodes on the left side. The mediastinal lymph nodes formed a mass the size of a cocoanut, occupying the entire mediastinal space. The abdominal lymph nodes were so markedly enlarged that it was impossible to remove the intestines in the ordinary manner. The retroperitoneal lymph nodes were also enlarged.

The spleen was twice its normal size, very soft, and showed localized areas of capsular thickening. The liver was about one-fourth and the pancreas three times larger than the normal size. Both kidneys were diffusely infiltrated with neoplastic tissue.

Microscopically there was a lymphocytic proliferation such as is observed in leucemias.

Comment. This case is that of an aleucemic leucemia with symmetrical involvement of the lacrymal, parotid, submaxillary and sublingual glands (Mikulicz's syndrome). Although the history of the onset of the disease is rather uncertain, it appears nevertheless that the primary manifestations were in connection with the lymphatic system and that the enlargement of the lacrymal and the salivary glands did not develop until later. This, then, indicates that the condition was "first and last" a true leucemia.

Case IV. (This case is included through the courtesy of Dr. R. M. McKean.) Mrs. G. Van T., aged fifty-seven, white.

History of Present Illness. In 1926, the patient first noticed a swelling over the right eye which was thought to have subsided following treatment by an ophthalmologist. In December, 1928, she developed a severe diarrhea for which she was treated in another hospital. At that time, during the course of the examination, an enlarged spleen was found and the patient was told that she had "leucemia."

In April, 1929, she noticed that she was becoming "anemic," and rather suddenly developed a generalized edema. In May of the same year, a small firm swelling appeared over the right eye, this being followed soon after by a similar swelling over the left eye, and by enlargement of the submaxillary glands.

From August 10 to August 21 and from September 14 to September 28, 1929, the patient was hospitalized in another institution where she received a series of roentgen treatments. Her blood count at that time (previous to treatment) was as follows: red blood cells, normal; white blood cells, 24,000; polymorphonuclears, 14.5 per cent; large lymphocytes, 75 per cent; small lymphocytes, 5.5 per cent; mononuclears, 3.5 per cent; lymphoblasts, 1 per cent; hb, 51 per cent. Following the roentgen irradiation, there was a rapid decrease in the size of the affected glands and the general condition of the patient showed considerable improvement.

Toward the end of September, 1929, there was recurrence of the swellings and on October 5, 1929, the patient was admitted to Harper Hospital for further irradiation.

The family history revealed that the mother had an "enlarged spleen" and one of her sisters died of pernicious anemia.

Physical Examination 10-5-29. The patient was a poorly nourished, adult female, with marked impairment of hearing.

The lacrymal gland of the right eye was enlarged to about the size of an almond; that of the left eye was normal. The pupils and sclerae were negative, the conjunctivae were pale. There was slight enlargement of the parotid glands and a marked enlargement of the submaxillary glands associated with considerable dryness of the mouth.

The posterior cervical lymph nodes were from 1 to 5 cm. in diameter, while the axillary and inguinal lymph nodes were from 1 to 1.5 cm. in diameter. The spleen was markedly enlarged, its lower border extending to just below the level of the umbilicus. The lower liver edge extended to about 2 inches below the costal margin.

There was marked edema of the lower extremities, which no doubt was due to her cardiac condition (chronic myocarditis).

Laboratory Data. Urinalysis negative. Red blood cells, 4,250,000; white blood cells, 24,550; hb, 55 per cent; polymorphonuclears, 31 per cent; large lymphocytes, 67 per cent; transitionals, 2 per cent. Blood chemistry normal. Icteric index 2. Van den Bergh negative in both direct and indirect test. Fragility: Hemolysis began at 0.35 per cent and was complete at 0.25 per cent. Blood Wassermann 4 plus, with cholesterinized antigen and slight inhibition with Kolmer antigen (two examinations).

Diagnosis. Chronic lymphatic leucemia, associated with Mikulicz's syndrome.

Treatment. It was decided to apply the same dose as generally used for chronic lymphatic leucemia.

Because of the condition of the patient, the treatment was administered only over each side of the face and both eyes (520 r, 80 per cent S.U.D., over each field, the quality of the roentgen rays being 0.14 Å). While there was a prompt local response of the treated lesions to the irradiation, the general condition continued to grow worse and the patient died on November 15 before the treatment could be completed.

No post-mortem examination was obtained.

Comment. The case is that of a chronic lymphatic leucemia associated with enlargement of the lacrymal and two pairs of the salivary glands (Mikulicz's syndrome). Roentgen therapy, although it led to prompt disappearance of the enlargements in connection with the Mikulicz syndrome, failed to influence the course of the lymphatic leucemia.

CASE V. T. B., boy, aged three, white.

History of Present Illness. In January, 1926, mother first noticed enlargement of the cervical lymph nodes. Several months later the inguinal lymph nodes were also enlarged and from this time on the child grew weaker and lost considerable weight. During the summer of 1926 both sides of the face started to swell and a marked dryness of the mouth developed. In October, 1926, the skin became icteric and the temperature frequently rose as high as 103°F. 11–30–26. Patient was admitted to Harper Hospital for treatment.

FIG. 5. Symmetrical enlargement of the parotid, submaxillary and lacrymal glands in a case of subacute lymphatic leucemia (Mikulicz's syndrome).

Physical Examination. The patient was a poorly nourished, very anemic child with an icteric tint to the skin. There was a generalized adenopathy, all superficial lymph nodes being enlarged from 1 to 5 cm. in diameter. There was also enlargement of the lacrymal, parotid and submaxillary glands (Fig. 5). The abdomen was markedly distended, due to enlargement of the spleen and the liver.

Laboratory Data: Blood count: Hb, 60 per cent; red blood cells, 3,620,000; white blood cells, 13,600; polymorphonuclears, 3 per cent;

large lymphocytes, 36 per cent, small lymphocytes, 61 per cent. Blood Wassermann negative.

Diagnosis. Subacute lymphatic leucemia, associated with Mikulicz's syndrome.

The patient died shortly after admission so that irradiation could not be carried out.

Comment. The case is that of a subacute lymphatic leucemia associated with enlargement of the lacrymal and salivary glands (Mikulicz's syndrome).

(2) *Tuberculosis.* Considerable discussion arose in the literature concerning the influence of tuberculosis on Mikulicz's disease, and its part in the production of the Mikulicz syndrome.

The coincident swelling of the lacrymal and one or more pair of the salivary glands with tuberculous lesions of various parts of the body induced many investigators to consider tuberculosis as a possible cause of Mikulicz's disease.

Meller[110] and Kayser[88] observed the occurrence of symmetrical enlargement of the lacrymal and parotid glands in association with lupus of the nose, while Séjournet[158] found the condition in a case with tuberculous ulcers of the tongue.

The following authors reported the occurrence of Mikulicz's disease in connection with tuberculous lesions of more distant parts of the body: Osler[125] and Fleischer,[51] each in a case of lung tuberculosis (in Osler's case there was also evidence of lues); Ranzi[140] in a case of bone tuberculosis; Plate and Lewandowsky[130] in a case of subcutaneous tuberculosis of the lower extremities; Lüdin[101] in a case of tuberculous pleuritis; Preston and Jeafferson[137] in a case of miliary tuberculosis, etc. In all these instances, however, the microscopic sections of the salivary or lacrymal glands, in those cases in which such sections were made, failed to reveal the presence of tubercle bacilli and, with few exceptions, even the characteristic appearance of tuberculous tissue. This, then, makes the cases valueless as far as their proof of the tuberculous nature of Mikulicz's disease is concerned.

Yet a careful review of the literature reveals that three cases have been published in which a symmetrical enlargement of the lacrymal and salivary glands was due beyond question to tuberculosis. In the first case, that of Plitt,[131] only the lacrymal glands were involved, but the lesion was symmetrical and therefore may be classified as a "forme fruste" of Mikulicz's disease. The tuberculin reaction was positive and the excised glands showed the presence of tubercle bacilli. In the second case, that of Krailsheimer,[90] the symmetrical swelling extended to both the lacrymal and salivary glands and although tubercle bacilli could not be demonstrated, the histologic examination of the extirpated glands showed typical tubercles. The diagnosis in this case was further substantiated by the subsequent development of bilateral tuberculous iridocyclitis and by the fact that the lesion healed promptly following the administration of neotuberculin. The third case (Napp[121]), which is the most conclusive of the three, showed a symmetrical involvement of both lacrymal and parotid glands, complicated by tuberculous nodules of the conjunctivae. The extirpated glands here showed the presence of the tubercle bacillus. Additional cases, in which tubercle bacilli could not be demonstrated, and yet which showed the typical histologic picture of tuberculosis, were reported by Meller,[108] Fleischer,[51] van Duyse,[41] Külbs[92], and more recently by Marsh[104] and Griffith.[63]

It is of particular interest in this respect that in two outstanding publications, after a detailed review of practically the same cases in the literature, the conclusions were diametrically opposed. Thus the first of the two, the work of Igersheimer and Pöllot,[83] after a survey of more than 55 articles, concludes that tuberculosis is rarely, if ever, a cause of Mikulicz's disease, while the second, the work of Detzel[37] after an analysis of 43 cases, maintains that tuberculosis is a frequent cause of Mikulicz's disease. Without wishing to appear too dogmatic, we, too, believe that

tuberculosis leads to the production of the Mikulicz syndrome more often than hitherto supposed. Thus in our series the association of tuberculosis with the Mikulicz syndrome was demonstrated in two cases. In one of these, the involvement extended to the parotid glands alone, while in the other it involved the submaxillary glands as well.

The radiation therapy of the Mikulicz syndrome occurring in connection with tuberculosis is carried out with the same technique and doses which are used in the treatment of tuberculosis of the lymph nodes.

CASE VI. C. O., Male, aged twenty-two, colored.

History of Present Illness. Since 1921 the patient has been treated in various hospitals for tuberculosis of the lungs, complicated with tuberculous granuloma of the cervical lymph nodes. While his lung condition seemed to remain stationary, the enlargement of the lymph nodes on both sides of the neck progressed gradually. In April, 1924, the enlarged lymph nodes on the right side of the neck were surgically removed. Following this operation, there was a fistula formation which persisted. In January, 1925, a swelling of both sides of the face and neck developed. This later became so pronounced that the patient, because of the marked pressure on the trachea, had difficulty in breathing.

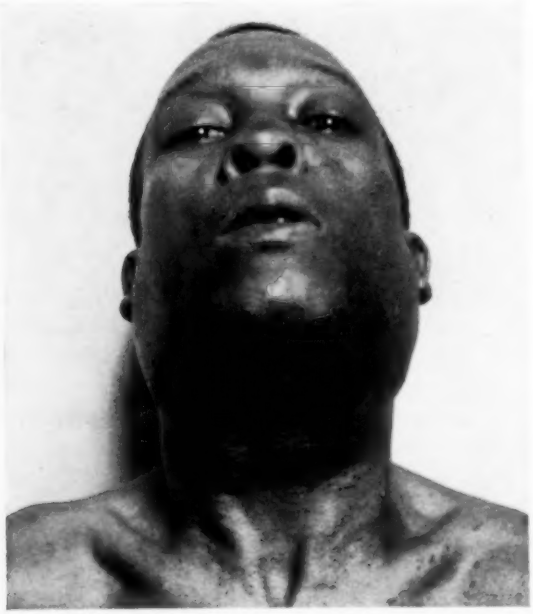

FIG. 6. Symmetrical enlargement of both parotid glands in a case of tuberculous involvement of the lymph nodes of the neck (Mikulicz's syndrome).

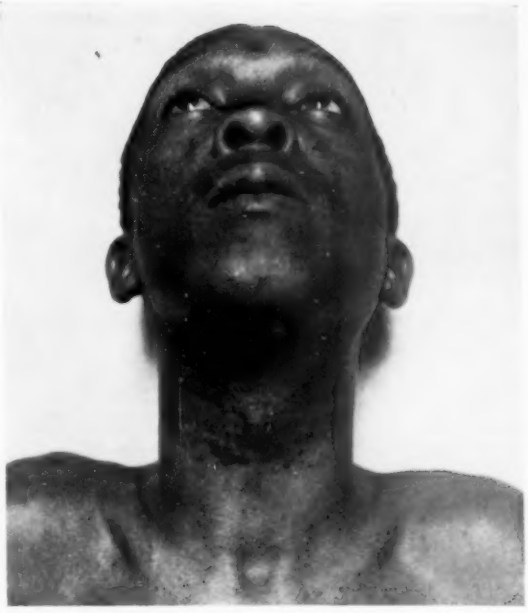

FIG. 7. Same as Figure 6, following roentgen irradiation with fractional doses as practised in tuberculosis.

Physical Examination 5–7–25. There was symmetrical enlargement of both parotid glands associated with enormous enlargement of the lymph nodes on both sides of the neck. Practically all of the cervical, submaxillary and supraclavicular lymph nodes were enlarged, some of them being as large as 8 to 10 cm. in diameter (Fig. 6). Posteriorly, on the right side of the neck there was a fistula which drained a greenish-yellow pus. There was no enlargement of the lymph nodes of the rest of the body. The roentgen examination of the chest showed a definite infiltration of the right apex, with bilateral thickening of the apical pleura. The temperature varied from 98 to 101°F. General condition was fair.

Laboratory Data. Urinalysis negative. Blood count: red blood cells, 3,700,000; white blood cells, 19,000; polymorphonuclears, 54 per cent; small lymphocytes, 35 per cent; large lymphocytes, 5 per cent; transitionals, 2 per cent. Blood Wassermann negative.

A lymph node removed for biopsy on May 3, 1925, showed typical tuberculous granuloma.

Diagnosis. Large tuberculous lymphadenitis of both sides of the neck, with definite infiltration of the right apex, associated with symmetrical enlargement of both parotid glands (Mikulicz's syndrome).

Treatment. Fifteen to 30 per cent S.U.D. over all the enlarged lymph nodes and parotid glands.

5–7–25. One area over each side of face and neck, field 20×20 cm., 200 kv., 1 mm. Cu, 1 mm. Al as filters, water-cooled tube, 25 ma., 10 min., 250 ma-min., skin target distance 80 cm, 30 per cent S.U.D. on the surface of the skin, 200 r. The treatment was repeated at intervals of from four to six weeks for a period of over one year.

There was a gradual decrease in the size of the enlarged parotid glands and lymph nodes until practically all lesions had disappeared (Fig. 7).

Comment. The case is that of an extensive tuberculosis of the lymph nodes of the neck, associated with symmetrical enlargement of both parotid glands (Mikulicz's syndrome). Following roentgen therapy, which extended over a period of a year, a healing of the condition resulted.

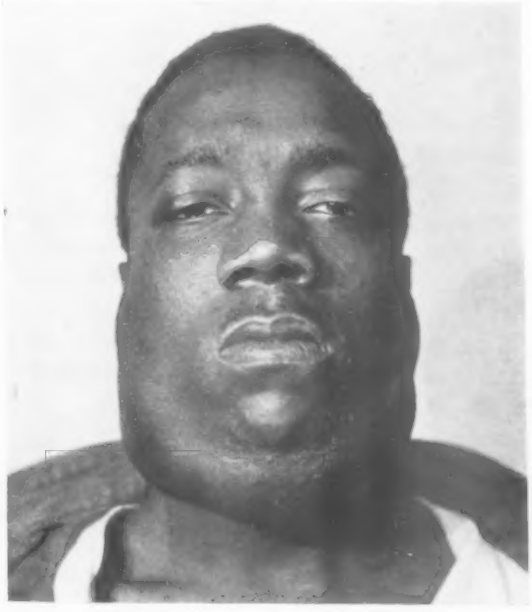

Fig. 8. Symmetrical enlargement of the parotid and submaxillary glands in a case of extensive tuberculosis of the lymph nodes of the neck (Mikulicz's syndrome).

Fig. 9. Same as Figure 8, lateral view.

Case VII. R. E., Male, aged twenty-one, colored.

History of Present Illness. In 1919, the patient noticed a small, pea-sized swelling in the submental region. This later extended to the submaxillary and parotid regions of the face. The development of the process had been slow at first, but during the last two years of the patient's life, it became much more rapid. There was no history of pain, tenderness or suppuration in the glandular enlargements.

Apart from the ordinary diseases of childhood and a Neisserian infection one year previous to his admission, the past history was negative. In 1927, the patient spent nearly a year in a tuberculosis sanitarium, where he was treated by heliotherapy, with only slight improvement. In April, 1929, he was referred to Harper Hospital for radiation therapy.

Physical Examination 4–9–29. The patient was a well-developed and nourished colored male. On the right side of the neck in the region of the angle of the jaw, there was a firm tumor mass which extended in a collar-like fashion to the angle of the opposite jaw. The parotid region on each side of the face was likewise occupied by a similar, though smaller tumor, the size of a large walnut (Figs. 8 and 9).

These masses were entirely painless, firm and freely movable. There was no evidence of suppuration or sinus formation. The lacrymal glands were not enlarged.

In addition, there was evidence of tuberculous infiltration of the right upper lobe, with cavitation.

Laboratory Data. Urinalysis: albumin, trace; sputum positive for tubercle bacilli. Blood count: Hb, 70 per cent; red blood cells, 4,200,000; white blood cells, 10,000; polymorphonuclears, 77 per cent; lymphocytes, 20 per cent; transitionals, 3 per cent. Kahn and Wassermann tests, 4 plus.

Diagnosis. Tuberculous lymphadenitis with infiltration and cavitation of the right upper lobe associated with symmetrical enlargement of the parotid and submaxillary glands (Mikulicz's syndrome).

Treatment. Fifteen per cent skin unit dose over each side of face and neck, field 20×20 cm., 200 kv., 1 mm. Cu, 1 mm. Al as filters, water-cooled Coolidge tube, 20 ma., 5 min., 100 ma-min., 65 cm. skin target distance, 100 r.

The treatment was repeated at intervals of from two to four weeks for eight exposures. At that time the affected glands were reduced to about one-half the original size.

In the meantime, the tuberculosis of the lung progressed rather rapidly so that in August, 1929, the patient had to be hospitalized (in another institution) and October 13, 1929, he died.

Comment. The case is that of an extensive tuberculosis of the lymph nodes and lungs, associated with bilateral involvement of the parotid and submaxillary glands (Mikulicz's syndrome). Roentgen therapy led to reduction in the size of the lesion treated, with temporary improvement in the condition of the patient. The rate of reduction in the size of the treated glands corresponded to that generally observed in tuberculosis. The patient died later as a result of the complicating lung affection.

(3) *Syphilis.* That syphilis may be an etiologic factor in Mikulicz's disease was first brought out by Osler.[125] In his case, a colored girl aged eleven, there was a symmetrical enlargement of the lacrymal and salivary glands associated with syphilitic rhinitis and pulmonary tuberculosis. From the post-mortem findings, it was not clear which of the two played the more important part in bringing about the Mikulicz syndrome. A combination of lues and tuberculosis was also observed in the cases of Lintz[100] and Posey.[135]

The possible occurrence of a symmetrical swelling of the lacrymal and especially of the salivary glands in syphilis was demonstrated by Gutmann,[65] Vennin and Worms,[178] Theodoresco,[173] Nagel,[120] de Massary and Tockmann,[105] Jeanselme,[86] Comby,[29] Sabrazès,[149] Bourges,[20] Bazàn and Maggi,[17] and more recently by Jeanselme, Huet and Desbrousses.[86] Moscovici[118] in 1919 wrote a monograph on the subject.

In some of the above cases, as in those of Gutmann, de Massary and Tockmann, Comby and Moscovici, a disappearance of the Mikulicz syndrome resulted following antiluetic treatment.

We did not have the opportunity to treat or observe a case in which syphilis could be definitely shown to be the etiologic factor in the production of the Mikulicz symptom-complex, although in two of our cases (Cases IV and VII), the Wassermann reaction was positive. We believe that in such instances antileutic treatment rather than radiation therapy would be the method of choice.

(4) *Lymphosarcoma and Hodgkin's Disease.* A relation between lymphosarcoma and Mikulicz's disease was suspected early. Some of the very first cases described in which the swelling of the lacrymal and salivary glands was associated with involvement of the entire lymphatic system (Adler[3] and Axenfeld[11]) served as proofs of the lymphosarcomatous nature of Mikulicz's disease. Wallenfang,[180] in 1904, after finding in one of his cases that the lymphocytic infiltration had broken through the capsule of the lymph nodes, ventured the statement that "the tumefactions of Mikulicz's disease do not belong to the pure aleukemic leukemias, but approach the commonly known malignant lymphosarcomas."

Shortly afterward, Caspary,[23] Meller,[110] Ziegler[188] and Pooley[132] reported additional cases in which the swelling of either the lacrymal or the salivary glands alone, or of both, was due to more or less typical lymphosarcomatous proliferations. With the advent of the theory of the "syndrome" nature of certain forms of "Mikulicz's disease," however, it became apparent that such proliferations must represent secondary localizations of the lymphosarcomatous process rather than true Mikulicz's disease on a lymphosarcomatous basis. Recent publications of Fernández,[48] Hardesty,[72] and Schaffer and Jacobsen,[155] also emphasized this "syndrome" nature of lymphosarcomas involving the lacrymal and salivary glands.

The method of irradiation in such instances must be the same as that used for lymphosarcoma in general,[45] that is, the entire lymphatic system must be exposed to radiation and a dose applied which is considerably larger than that used in Mikulicz's disease proper.

Case VIII. Mrs. W. D., aged fifty-seven, white.

History of Present Illness. In June, 1929, the patient noticed excessive lacrymation, followed soon afterward by the appearance of a small, painless swelling in the upper lid of the left eye. A few months later, a similar swelling occurred in the right upper eyelid.

In October, 1929, the tumor of the left eyelid was removed. The pathological report was that of a small, round cell lymphosarcoma.

The past history was entirely negative.

11–20–29, the patient was admitted to Harper Hospital for radiation therapy.

Physical Examination 11–20–29. The patient was a well-developed, well-nourished adult female.

There was a partial ptosis of both eyelids and a tumor 2.5 cm. in diameter over the right eye in the region of the lacrymal gland. In the region of the left lacrymal gland, there was a small scar representing the site of the former operation. Both conjunctivae were injected and there was some induration and a tendency to entropion of the eyelids.

There was definite enlargement of the preauricular, postauricular and submaxillary lymph nodes on both sides, giving a "Mikulicz facies." There was also enlargement of the cervical, supraclavicular and axillary lymph nodes on the right side. The spleen and liver were of normal size.

Laboratory Data. Urinalysis negative. Blood count: Hb, 100 per cent; red blood cells, 4,230,000; white blood cells, 8,200; polymorphonuclears, 66 per cent; lymphocytes, 20 per cent; transitionals, 10 per cent; eosinophiles, 4 per cent. Blood Wassermann negative. Blood chemistry normal.

Diagnosis. Generalized small round cell lymphosarcoma associated with involvement of both lacrymal glands (Mikulicz's syndrome).

Treatment. Ninety per cent S.U.D. (590 r) over the entire lymphatic system including both lacrymal glands and both sides of the face. The treatment was spread over a period of ten days (Nov. 20 to Nov. 30, 1929), one to two areas having been exposed daily. The total number of areas treated was fourteen.

Following the irradiation there was a "melting away" of all tumors, such as is generally observed in lymphosarcomas. The enlarged lacrymal glands assumed their normal appearance and all symptoms in connection with the eyes disappeared.

The general condition of the patient at the present time is satisfactory.

Comment. The case is that of a rather generalized, small round cell lymphosarcoma, with a symmetrical extension of the process to both lacrymal glands (Mikulicz's syndrome). Following administration of roentgen therapy, all tumors "melted away" and the eye symptoms disappeared.

The occurrence of the Mikulicz syndrome in Hodgkin's disease is comparatively rare. In a detailed survey of the literature, we were able to find only a few instances in which reference is made to the possibility of association of these two conditions (Ziegler,[188] Minelli,[115] and McDonald and Wardale[106]).

We have observed one case in which Hodgkin's disease led to a symmetrical involvement of both parotid glands, resulting in a "Mikulicz facies."

CASE IX. Mr. G. A., aged fifty-six, white.

History of Present Illness. In August, 1928, the patient noticed a small firm tumor in the right supraclavicular fossa, which gradually increased in size. At the end of three months, similar tumor masses were noted in both cervical and postauricular areas. The sides of the face were likewise somewhat involved in the process. Later enlargement of the lymph nodes appeared in the submental, submaxillary, axillary and inguinal regions.

The above described tumor masses were never painful and had never suppurated.

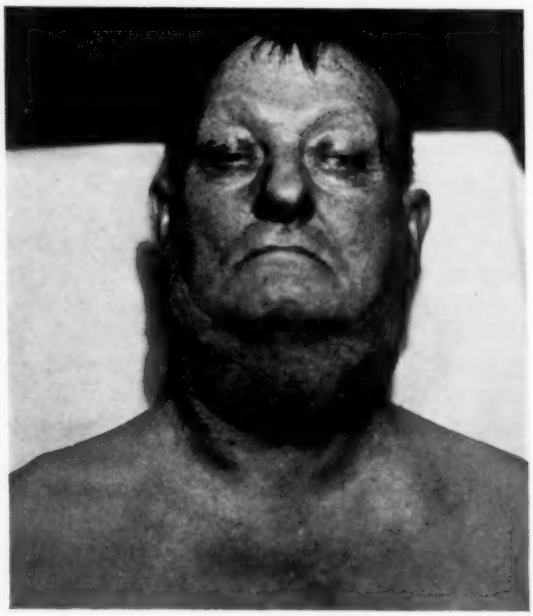

FIG. 10. Symmetrical enlargement of both parotid glands in a case of Hodgkin's disease (Mikulicz's syndrome).

During the course of his illness, the patient lost about 30 lbs. in weight, and complained of marked fatigability.

The past history was negative except for an injury to the left eye about twenty years previously, resulting in a partial loss of the vision of the eye.

At another institution, on Jan. 17, 1930, a section was taken from the left side of the face and eight days later, one from the right side of the face. The microscopic report in both instances was Hodgkin's disease.

On Feb. 6, 1930, the patient was transferred to the Harper Hospital for radiation therapy.

Physical Examination 2–6–30. The patient was a well developed and well-nourished male.

There was a marked swelling of both sides of the neck and face due to enormous enlargement of the cervical, submaxillary, submental and pre- and postauricular lymph nodes. The lesion also invaded both parotid glands (Fig. 10), resulting in marked dryness of the mouth.

The left eye presented a rather large leucoma at the site of the previous injury, with a divergent strabismus. The lacrymal glands were normal.

There was enlargement of the supraclavicular, axillary and inguinal lymph nodes on both sides, from 1 to 5 cm. in diameter.

The spleen and liver were of normal size.

Laboratory Data. Urinalysis negative. Blood count: Hb, 60 per cent; red blood cells, 3,360,000; white blood cells, 9,750; polymorphonuclears, 87 per cent; large lymphocytes, 9 per cent; transitionals, 4 per cent. Blood Wassermann negative; blood nitrogen negative.

Diagnosis. Hodgkin's disease, associated with symmetrical enlargement of both parotid glands (Mikulicz's syndrome).

Treatment. The entire lymphatic system, as well as the enlarged parotid glands, was irradiated with doses of 90 per cent S.U.D. (590 r) over the individual fields. The rate of response to the radiation was that usually observed in Hodgkin's disease. The patient is still under treatment.

Comment. The case is that of a rather generalized Hodgkin's disease with marked swelling of both sides of the neck and face, due to involvement of the cervical, submaxillary, submental, and pre- and postauricular lymph nodes, as well as of the parotid glands (Mikulicz's syndrome). Following roentgen therapy, there was decided improvement in the condition of the patient.

(5) *Uveoparotid Fever.* In 1909, Heerfordt[75] described a condition which he called "febris uveoparotidea subchronica" and which he considered an atypical manifestation of epidemic parotitis.

The three cases observed by Heerfordt —and a few others collected from the literature—which served as a basis for the description of the disease, presented: (1) fever, which was only slight and of long duration; (2) iridocyclitis, occasionally

complicated with optic neuritis; (3) parotitis, in some instances associated with involvement of other salivary and the lacrymal glands, and (4) paresis of one or several cerebrospinal nerves. It is obvious that there is a great similarity between this symptom-complex and Mikulicz's disease. For this reason several investigators classified febris uveoparotidea subchronica as a form of the Mikulicz syndrome.

Following the initial publication of Heerfordt, numerous other articles describing similar conditions appeared in the literature. By 1924, Berg[18] had collected 40 cases, from a survey of which he concluded that febris uveoparotidea subchronica was merely a syndrome which might be the result of tuberculosis (Gjessing,[61] Michaelsson,[112] Heine,[76] and Critchley and Phillips[33]), syphilis, atypical mumps (Weve[182]), or that it may represent a subvariety of Mikulicz's disease. A similar opinion was expressed by Hamburger and Schaffer,[70] who recently made a very detailed investigation of all questions pertaining to this condition.

There were only two cases of uveoparotid fever recorded in the literature which were treated by radiation therapy. The first, that of Jackson,[84] had enlargement of the parotid glands associated with a bilateral iridocyclitis and a partial facial paralysis. The irradiation of the eyes and parotid glands (five treatments at weekly intervals with 4 ma., 125 kv., 10 in. distance, 5 min., 5 mm. Al filter) resulted in permanent healing.

The second case, that of Hamburger and Schaffer,[70] likewise showed enlargement of the parotid glands, with bilateral iridocyclitis except that here the eye manifestations were early. Three radium applications were made under the direction of Burnam and Kelly, the dose being as follows: 2 gm-hr. irradiation screened with 1 mm. brass and 1 mm. lead at a distance of 5 cm. (first for the right parotid alone, 6 days later for the left parotid alone, and again 15 days later for both parotids simultaneously). The result of the irradiation was striking: within a few weeks there was entire disappearance of the swelling of the parotid glands and the iridocyclitis disappeared rapidly. A re-examination five years later revealed that the condition had healed permanently. The only evidence of the previous iridocyclitis was a few corneal deposits and the fine vitreous opacities.

We have not had an opportunity to observe a case of uveoparotid fever. For a while there was some doubt in our minds with regard to the classification of our first case, but because or the long duration and the localization of the eye lesions to the cornea alone, we did not feel justified in including this case as an example of uveoparotid fever.

CONCLUSIONS

On the basis of a study of nine cases, we believe that "the symmetrical enlargements of the lacrymal and one or more pair of the salivary glands," originally described as Mikulicz's disease, should be divided into two main groups: Mikulicz's disease proper and the Mikulicz syndrome.

Under Mikulicz's disease proper are included all cases of symmetrical, non-inflammatory swellings of the lacrymal and salivary glands without involvement of the lymphatic system and without alteration of the blood.

Under the Mikulicz syndrome are included the cases in which the enlargements of the lacrymal and salivary glands are manifestations of some clinically and pathologically well-defined disease, such as leucemia, tuberculosis, syphilis, lymphosarcoma, Hodgkin's disease, uveoparotid fever, etc.

In the first group, the technique of the radiation therapy is based on the principle that there is a lymphocytic infiltration with an organized structural arrangement, so-called "lymphadenosis," of the affected lacrymal and salivary glands. This implies that divided doses (15 to 50 per cent S.U.D.) spread over a longer period are more beneficial than the one single massive dose as

administered in neoplastic processes. For the same reason, the quality of the rays used is of considerably less importance.

In the second group, since the involvement of the lacrymal and salivary glands is merely a manifestation of a more or less distinct clinical entity, a technique should be used which conforms to the routine procedure of irradiation applied in that particular entity.

It has been repeatedly suggested that Mikulicz's disease proper be considered an "aleucemic stage" of leucemia. There are two reasons why this should not be done: First, the average life duration is considerably longer in Mikulicz's disease than in either the acute or chronic forms of leucemia; second, the radiosensitivity of the lymphocytic infiltration, because of its organized structural arrangements in Mikulicz's disease, is definitely less than in the more malignant, and consequently less differentiated lymphocytic proliferations in leucemias.

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UNUSUAL CHOLECYSTOGRAMS AND THEIR INTERPRETATION*†

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THERE are several theories concerning the function of the gall-bladder which may be grouped into two fundamental divisions, depending upon whether the cystic duct is considered a one-way or a two-way passage. Sweet[13,15] Halpert,[7,8] Demel and Brummelkamp[4] and Blond,[1] believe that the cystic duct is a one-way tube. Sweet, who first announced this theory, believes that whatever enters the gall-bladder leaves normally only by absorption.[14]

One of the most important reasons for this point of view is based upon an extensive study of the valve arrangement of the cystic duct, and its tortuosity. The valves are there for some reason, yet they do not prevent the bile from entering the gall-bladder. After the gall-bladder has concentrated the bile ten times at least, it would be ten times as hard for this bile to leave the gall-bladder, on the basis of viscosity alone, even if there were no valves.

Winkelstein,[17,18] Graham,[5,6] McMaster and Elman,[12] Higgins and Mann,[9] Whitaker,[16] Boyden,[3] Boyden and Birch,[2] and Ivy and Oldberg,[11] believe that the cystic duct is a two-way duct, bile entering and leaving by the same channel. Winkelstein believes that bile leaves the gall-bladder through the force of the respiratory movements. Graham thinks the incoming bile forces that already in the gall-bladder to leave. The others believe that the gall-bladder squeezes bile out by muscular activity in its own wall.

The purpose of this paper is to show some unusual roentgenograms following the Graham test, and to see which theory best explains the gall-bladder function in that particular set of roentgenograms. If a theory is to stand it must explain the unusual cases as well as the normal cases.

The visualization shown in the accompanying roentgenograms followed the routine oral administration of the dye. At the twelfth hour, the gall-bladder is visualized. At the sixteenth hour the gall-bladder shadow ordinarily decreases slightly in size, but increases in density. At the seventeenth hour the shadow usually decreases greatly in size and may disappear.

Sweet explains these changes on the basis of absorption as follows: At the sixteenth hour the shadow becomes slightly smaller and denser because the dye is being absorbed (causing the shadow to grow smaller), at the same time water is absorbed faster than the dye (causing the shadow to become denser). After a fat meal the gall-bladder shadow diminishes greatly in size because, first, fat stimulates liver secretion and opens the papilla of Vater (thus causing this increased dye secretion to enter the intestine rather than the gall-bladder). Second, fat and fatty acids precipitate the dye, rendering it insoluble and not absorbable (so that it cannot be reabsorbed from the intestine to eventually maintain the shadow in the gall-bladder). Higgins and Wilhelmj[10] have recently shown that whatever action the fat might have, is exerted in the intestine, for intravenous injection of fat has no effect on the emptying of the gall-bladder. Finally, fat may possibly stimulate gall-bladder absorption.

Now, does the giving of a high fat meal add in any way to the interpretation of the case, or is it really a disadvantage because it throws a burden of added expense upon the patient? We have obtained all the knowledge we can about the condition of

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the gall-bladder with the twelve hour roentgenogram alone. The very fact that the gall-bladder fills indicates that the cystic duct is open, and that the gall-bladder is able to empty itself by some means or other, for unless it were doing so, no dye-containing bile could have entered.

The roentgenologist would bring up the fact that some dye shadows do not contract after a fat meal, and might say that these gall-bladders are pathological, and have been found in a state of chronic in-

Fig. 1*a*. A gall-bladder filling with dye at the twelve hour examination.

flammation by the pathologist. However, this may be the very group of cases not benefited by the operation of cholecystectomy, because it is more likely that the papilla of Vater did not open so as to allow fat to act on the dye coming from the liver rather than that any real pathology actually existed in the gall-bladder.

Those who believe in the dilution theory explain the sixteen hour roentgenograms by saying that the less concentrated bile and dye on entering the gall-bladder goes to the periphery. Some of the more concentrated bile and dye is thus expelled through the cystic duct. The fat meal,

Fig. 1*b*. A gall-bladder concentrating the dye at the sixteen hour examination.

causing increased liver secretion, merely accentuates this phenomenon. However, when liver secretion is increased and the papilla of Vater opens, most authorities agree that bile enters the duodenum and

Fig. 1*c*. A gall-bladder shadow which is fainter but of the same size at the seventeen hour examination.

Fig. 2*a*. Cholecystogram before a high fat meal.

not the gall-bladder. The increased density seen at the sixteenth hour must nevertheless be explained by the water absorption taking place at that time.

Even those who feel that the gall-bladder forces its contents out through the cystic duct must grant an absorptive and concentrating power to the gall-bladder in order to explain the roentgenograms at the sixteenth hour.

Figures 1*a*, 1*b* and 1*c* show a gall-bladder filling at the twelfth hour, concentrating at the sixteenth hour, decreasing in density at the seventeenth hour, yet the size of the gall-bladder remains unchanged. This is what normally takes place in the dog's gall-bladder. It could be explained as follows: At the sixteenth hour the dye is concentrated by the absorption of some of the water and still less of the dye. At the seventeenth hour, following a fat meal, absorption of the dye is taking place, but no contraction of the dye shadow occurs because diffusion of the dye throughout the entire gall-bladder is taking place as fast as absorption occurs. Thus the dye density decreases uniformly throughout, instead of of at the periphery where it does normally. In the normal gall-bladder, bile is thick and the dye is held in greater attraction. The thick bile at the center of the gall-bladder permits of a slower diffusion of the dye particles, while there is rapid absorption at the periphery. In this manner the shadow contracts in size. In a dog's gall-bladder the bile is thin, as a rule, and the dye is diffused as fast as absorption takes place, and therefore there is no contraction of the shadow. The shadow will disappear without materially changing in size. So here we have a case where diffusion and absorption is similar to that found in a dog's gall-bladder.

Those who believe in the dilution theory assume that at the seventeenth hour the less concentrated mixture of bile and dye coming from the liver, forced some of the more concentrated mixture out of the gall-bladder, and as a result there was a uniform diffusion, causing the density of the shadow to decrease. But how can they

Fig. 2*b*. The dye shadow grows larger and less dense after a fat meal.

explain the increased concentration at the sixteen hour examination?

Exponents of the contraction theory would state that we have a pathological case. Normal function is not taking place because the gall-bladder is pathological. Absorption must play a part, however, because the shadow at sixteen hours has increased in density while not changing in size. A disease process which has destroyed the muscular coat and not the mucosa, would have to be present.

Figures 2*a* and 2*b* show the shadow of the gall-bladder which became much larger after a fat meal. How are the exponents of the theory of contraction to explain this? They must again predicate a pathological state, which was probably not present, since a repetition of the test showed the gall-bladder to function well. Possibly a temporary closure of the papilla of Vater has backed up the increased liver secretion following the high fat meal.

Figure 2*b* shows the gall-bladder shadow to be much larger, and the density greatly decreased, after the fat meal. Is this possible because the incoming bile has diluted the already concentrated bile? The gall-bladder became larger because it could not absorb as fast as the liver secreted to it.

Fig. 3*a*. Cholecystogram before a fat meal in a jaundiced patient.

Fig. 3*b*. Contraction of the dye shadow after a high fat meal. Patient was jaundiced.

Figures 3*a* and 3*b* show an apparently normal gall-bladder shadow with normal function, although the patient was jaundiced. One can readily see how this might take place if the gall-bladder function is purely one of absorption. It would be hard to explain this on the basis of contraction. To do this it would have to contract against the greatly increased pressure in the biliary system.

Figures 4*a* and 4*b* show stones apparently pushed up by the gall-bladder contraction after a fat meal. This seems to offer the strongest argument for the contraction theory. Sweet offers three explanations: (1) The gall-bladder may absorb its fluid content. When this takes place the stones are rearranged because of the elasticity of the gall-bladder wall. (2) Variation in the specific gravity of the bile may cause the stones to rise or fall, changing their positions and giving rise to the impression

Fig. 4*a*. A gall-bladder filled with dye and stones.

Fig. 4*b*. After a high fat meal, the stones are rearranged.

Fig. 5*a*. Dye shadow before a high fat meal.

Fig. 5*b*. Two dye shadows are seen in the gall-bladder after a high fat meal: a dense shadow in the upper right-hand corner and a light shadow surrounding this. The outer edge of the light shadow may mark the boundary of the gall-bladder mucosa.

Fig. 6*a*. Dye shadow before a fat meal.

Fig. 6*b*. Dye shadow after a fat meal. The gall-bladder mucosa seems to follow the dye shadow contraction.

of contraction. It should be remembered that human gall-bladder bile is more often a thin jelly than a watery solution. A colloid condition exists which must influence the movement of dye molecules and the relation of larger masses, such as stones, contained within the gall-bladder. Sometimes a faint shadow of relatively decreased density may be seen about the periphery of the dense shadow. The exact cause of this is unknown. It may be that it represents a shell of bile from which the dye has been absorbed by the neighboring mucosa. This is difficult to reproduce, but can be seen fairly well in Figures 5*a* and 5*b*.

In Figures 6*a* and 6*b* those who believe in contraction will say that the shadow represents the outline of the gall-bladder. This may be the case and still be accounted for by absorption, especially if the gall-bladder were absorbing its contents and no more bile were entering through the cystic duct.*

* These cases were studied in the Gastro-enterology Department of the Cornell Clinic under Dr. S. Weintraub. The roentgenograms were taken in the Department of Roentgenology of Cornell Clinic under Dr. J. R. Carty. To Dr. W. W. Belden of the Department of Roentgenology, New York Hospital, we are indebted for the roentgenograms in Figures 1*a*, 1*b* and 1*c*.

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HYPERPLASIA OF THE THYMUS

A STUDY OF 1045 PATIENTS INCLUDING AVAILABLE FAMILY AND MATERNAL HISTORY

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CONVULSIVE seizures in infants, an age old topic, may be from various causes, but the one cause which is of interest to a larger group than any other is that of persistent thymus.

This condition has been discussed in many phases by pathologists, roentgenologists, pediatricians and obstetricians but apparently so far it has not been studied from the standpoint of heredity.

Since the introduction by Lange[10] in 1911 of roentgen therapy for this particular condition, the question of both diagnosis and treatment has usually been determined by the roentgen examination.

The pathologists are interested in cases of enlarged thymus because of the fact that they have emphasized the importance of early diagnosis and feel that to some degree the deaths from it are preventable and that they as teachers have not made the desired impression on physicians and students.

The roentgenologists are interested in cases of enlarged thymus because in their hands lies the diagnosis and treatment.[17]

The pediatricians are interested in cases of enlarged thymus because it is a condition existing almost wholly in their field, a large percentage of cases being discovered and treated during early childhood. It is of utmost importance for them to exclude this as well as all other possible complications during the diseases of early childhood, especially during the tonsil and adenoid age.[12]

The obstetrician is interested in cases of enlarged thymus because the care of the new-born infant is his for a period after delivery and he is often consulted about the baby after the mother has been discharged.

The surgeon is interested in cases of enlarged thymus more now than he was a few years ago since he realizes that he should know whether or not the patient has a persistent thymus.[14] There is no greater tragedy than that of a supposedly normal child dying during or immediately following the administration of an anesthetic.

ANATOMY AND HISTOLOGY

The thymus gland is an organ with two lobes, subdivided into lobules and further divided into medulla and cortex. The cortex is made up of lymphocytes and the medulla of a network of cells in which may be found the characteristic Hassall's corpuscles. The gland lies in the upper anterior mediastinum in close relation to the heart, great vessels, and anterior to the trachea.[16] The thymus evidently reaches its maximum size at birth or shortly afterward and then may vary in size during early life before beginning to atrophy.[19]

IMPORTANCE OF DIAGNOSIS

At the present time when so much effort is being devoted to prenatal and postnatal care, and properly directed feeding of infants, it seems that this great danger to the new-born—hyperplasia of the thymus—should not be overlooked. Each year statistics are widely disseminated showing a decrease in infant and maternal mortality, and advice is given about how the figures may be still further lowered. The publication of The Children's Bureau of the U. S. Department of Labor states that convulsions are not usually serious.[8] No mention is made of the influence the condition of enlarged thymus, a preventable cause, has on the death rate of infants. An early diagnosis is of vital importance.

CLINICAL SIGNS AND SYMPTOMS

All of the clinical signs and symptoms attributed to enlarged thymus have often been enumerated and should constantly be borne in mind to avoid error in diagnosis.[5] They may be listed as: (*a*) respiratory difficulty; (*b*) transitory cyanosis, often with unconsciousness; (*c*) asthenia; (*d*) snuffles; (*e*) the so-called thymic stridor; (*f*) regurgitation, and (*g*) abnormal sounds during crying.[9] Older children often exhibit one or more of the following indications of the existing condition: (*a*) undernourishment and pallor, and (*b*) enlarged and early hypertrophy of the tonsils and adenoids. Some of the thymic symptoms occurring during infancy may be carried on into later years.

ROENTGEN DIAGNOSIS

Roentgen examination shows a broad convex shadow in the upper superior mediastinum above the shadow of the heart, wider in the lower portion, and sometimes fitting over the upper border of the heart. The thymus shadow shows no appreciable change in size in relation to the cardiac cycle,[2] but does change in size and shape with respiration and effort, such as crying or struggling. Both lobes need not be enlarged to the same degree, and a large thymic shadow does not necessarily mean the presence of clinical symptoms.[4] At times a marked dyspnea may result from a posterior enlargement which gives only a slight increase in breadth to the shadow.

The technique of the roentgen examination should be such as to exclude all possible errors and provide for a differential diagnosis between cardiac enlargement, lung pathology, congenital anomalies, azygos lobe of the lung, and enlarged mediastinal glands.

TREATMENT

The treatment of an enlarged thymus lies wholly in the use of roentgen rays or radium,[15] the selection of the agent to be used being at the discretion of the radiologist.[6]

The dosage used at present is not so intensive as that used several years ago. This laboratory has found satisfactory results to be obtained by using a fractional schedule, and in cases of a very large thymus by increasing the dosage at each subsequent treatment. Our treatment in these cases has been as follows: 103 kv. (peak); 5 ma., 3 mm. Al filter, 12 in. distance, 3 min. The equipment used with the above setting delivers during this time 55 r with a half-value layer of 2.7 mm. Al Lambda effective through 2.0 mm. Al, 0.38Å. No ill effects have been noted in any of the cases treated and this dosage is not considered detrimental to the child.[7]

RESPONSE TO TREATMENT

Re-examination of the chest after therapy has shown a decrease in size of the thymic shadow in all except a few cases. Symptoms when present, and explained by the presence of the thymic shadow, have disappeared in all cases during the course of treatment. Four treatments are usually administered to those patients having a large thymic shadow.

There appears to be a certain type of enlargement of the thymus gland which does not diminish appreciably in size even after extensive treatment although the symptoms subside. While this is contrary to the findings of Spohn,[20] we have had 15 such cases.

The entire structure evidently becomes fibrous in nature and this of course does not show any effects of the treatment administered. In other cases when there is no demonstrable lateral enlargement, an encroachment on the structures posteriorly by increase in size of the gland in this direction may give rise to symptoms. Even if no enlargement can be seen in either direction, but symptoms are present, therapy is indicated.[13] Following this therapeutic test, if the condition is caused by the thymus, the symptoms will shortly disappear.

OBSERVATIONS

The cases which were observed as a basis for this article were divided into three

Groups, I, II and III. Group I is further subdivided into I (*a*) and I (*b*). Group I (*a*) consists of 500 consecutive newborn infants who were examined from twenty-four to forty-eight hours after birth; I (*b*) consists of infants a few hours to a few days old, who were born in the hospital but were examined only because there were indications that they might have an enlarged thymus. This series consists of those examined before a routine roentgen examination of all babies born in the hospital was inaugurated.

Group II is made up of a series of infants ranging from a few hours to six months of age who were referred to the hospital for examination because of some symptom, or as a part of a general examination by a physician. In this group, 68 cases were referred for examination because of symptoms attributed to an enlarged thymus;[18] 24 of these were negative from a roentgen standpoint. Nevertheless, the number of positive findings is enough to convince one that a history of symptoms cannot be disregarded.

Group III consists of children referred for roentgen examination of the chest prior to operation for tonsils, adenoids, harelip, extraction of a foreign body from the bronchi, or because of suspicion of some chest condition.

Consideration will first be given to Group I (*a*) and (*b*) as the available records on the cases under the other two groups reveal little relative to the early history of the patient or members of the family.

RELATION TO SEX

The proportion of females with a positive finding in this series is slightly in excess of the males. However, this excess is not sufficient to indicate that females are always more likely to have enlargement of the thymus gland. Barnett[1] also shows a predominance of females.

BIRTH WEIGHT OF THE BABY

The fallacy of the belief that only large babies may have a thymus shadow is well

GROUP I (*a*)

EXAMINATION OF THE CHESTS OF 500 CONSECUTIVE NEW-BORN APPROXIMATELY 24–48 HOURS AFTER BIRTH.

Weight lb.	Total	Positive	Borderline	Negative
4½– 5	11		1	10
5 – 5½	7		2	5
5½– 6	16	2		14
6 – 6½	37	1	1	35
6½– 7	67	10	2	55
7 – 7½	102	14	6	82
7½– 8	76	8	4	64
8 – 8½	88	14	6	68
8½– 9	40	8	5	27
9 – 9½	26	5	1	20
9½–10	23	10		13
10 –10½	3			3
10½–11	3	1	1	1
11 –11½	1	1		
	500	74	29	397

Mother's age	Total	Positive	Borderline	Negative
16	1			1
17	1	1		
18	2			2
19	15			15
20	18	2		16
21	27	3	2	22
22	28	1	3	24
23	34	5	1	28
24	30	2	3	25
25	40	6	3	31
26	38	7	1	30
27	36	5	4	27
28	36	5	1	30
29	31	7	3	21
30	29	5	1	23
31	23	6	1	16
32	16	3	1	12
33	17	2	2	13
34	16	2	1	13
35	10	2		8
36	11	1		10
37	7	1	1	5
38	16	5	1	10
39	5	1		4
40	2			2
41	5	2		3
42	3			3
43	1			1
44	2			2
	500	74	29	397

Sex	Total	Positive	Borderline	Negative
Male	245	34	13	198
Female	255	40	16	199
	500	74	29	397

Thyroid History (Mother)

Condition	Total	Positive	Borderline	Negative
Enlargement	64	12	6	46
Surgical	9	1		8
Treatment	6	2	1	3
Negative	421	59	22	340
	500	74	29	397

Number of Child (Pregnancy)

Pregnancy	Total	Positive	Borderline	Negative
1st	259	24	13	222
2d	126	27	11	88
3d	64	17	2	45
4th	30	5	2	23
5th	14	1	1	12
6th	3			3
7th	3			3
8th				
9th	1			1
	500	74	29	397

Number of Mothers Having had a Miscarriage or Stillbirth

Total	Positive	Borderline	Negative
29	4	1	24

Family Record

	Total	Positive	Borderline	Negative
Former children negative	44	0	3	41
Former children positive	33	24	2	7
First pregnancy	259	24	13	222
No record of former children	164	26	11	127
	500	74	29	397

Group I (*b*)

THIS SERIES IS MADE UP OF 165 NEW-BORN INFANTS WHO WERE REFERRED TO THE ROENTGEN-RAY DEPARTMENT FOR EXAMINATION BECAUSE OF SUSPICIOUS SIGNS OR OTHER INDICATIONS POINTING TOWARDS AN ENLARGED THYMUS. THESE CASES BORN IN THE HOSPITAL ARE COMPARABLE TO GROUP III.

Weight lb.	Total	Positive	Borderline	Negative
4 – 4½	3			3
4½ – 5	2			2
5 – 5½	2			2
5½ – 6	4	1		3
6 – 6½	5	3	1	1
6½ – 7	23	9	2	13
7 – 7½	27	9	2	16
7½ – 8	38	11	7	20
8 – 8½	15	3	1	11
8½ – 9	18	8	1	9
9 – 9½	9	7	2	1
9½ – 10	8	7		1
10 – 10½	8	7		1
10½ – 11	2	2		
11 – 11½	1	1		
	165	68	16	81

Mother's Age	Total	Positive	Borderline	Negative
19	1			1
20	4	1	1	2
21	1			1
22	4	2		2
23	8	2		6
24	13	7		6
25	14	4	2	8
26	16	6	1	9
27	10	6		4
28	24	8	4	12
29	19	9	3	7
30	7	4		3
31	11	4	2	5
32	12	5	2	5
33	2			2
34	4	2		2
35	3	1	1	1
36	4	2		2
37	3	2		1
38	3	2		1
39	1	1		
40				
41				
42				
43				
44	1			1
	165	68	16	81

Sex	Total	Positive	Borderline	Negative
Male	80	32	5	43
Female	85	36	11	38
	165	68	16	81

Thyroid History (Mother)

	Total	Positive	Borderline	Negative
Enlargement	18	9	1	8
Surgical	2	2		
Treatment	4	2	1	1
Negative	141	55	14	72
	165	68	16	81

Number of Children

Pregnancy	Total	Positive	Borderline	Negative
1	67	26	4	37
2	53	17	7	29
3	30	16	4	10
4	10	7		3
5	4	2	1	1
9	1			1
	165	68	16	81

Mother Having had Miscarriage or Stillbirth

Total	Positive	Borderline	Negative
12	3		9

Family Record

	Total	Positive	Borderline	Negative
Former children negative	7			7
Former children borderline or positive	20	17	3	
First pregnancy	67	26	4	37
No record of former children	71	25	9	37
	165	68	16	81

Group II—Contains 7 cases of former thymus negative with 5 positive and 2 negative in subsequent children.

Group III—Contains 3 cases with former positive findings and all are positive in subsequent children.

GROUP II

245 CHEST EXAMINATIONS IN CHILDREN RANGING IN AGE FROM SIX MONTHS TO EIGHT YEARS

Sex	Total	Positive	Borderline	Negative
Male	132	4	11	117
Female	113	7	7	99
Total	245	11	18	216

Age	Total	Positive	Borderline	Negative
6 mos.	22	2	3	17
6 mos.–1 yr.	13	1	2	10
1½ yrs.	13	1	2	10
2 yrs.	25	4	4	17
3 yrs.	26	1	1	24
4 yrs.	28	2	2	24
5 yrs.	24		1	23
6 yrs.	36		1	35
7 yrs.	21			
8 yrs.	26		1	25
Age not given	11		1	10
	245	11	18	216

Symptoms	Total	Positive	Borderline	Negative
Yes	4	1		3
No	65	2	5	58

Diagnosis	Total	Positive	Borderline	Negative
Chest pathology	63	1	2	60
Preoperative	25	4	4	17
Cleft palate; hare lip	37	4	6	27
*Others	49	2	5	42
No diagnosis	71		1	70
	245	11	18	216

* Preliminary diagnosis—tuberculous glands, foreign body of the esophagus or bronchi, malnutrition, congenital heart, epilepsy, etc.

Number of Child	Total	Positive	Borderline	Negative
1	42	3	6	33
2	31	1	3	27
3	19	3	2	14
4	7			7
5	3			3
6	1			1
12	1			1
Not classified*	141	4	7	130
Total	245	11	18	216

* In hospital and out-patient department records the number of brothers and sisters not always enumerated.

Group III

GROUP III CONSISTS OF 135 CASES OF INFANTS RANGING IN AGE FROM NEW-BORN TO SIX MONTHS OF AGE FROM OUT-PATIENT DEPARTMENT AND REFERRED FOR X-RAY EXAMINATION ONLY.

Sex	Total	Positive	Borderline	Negative
Male	85	40	4	41
Female	50	15	2	33
Total	135	55	6	74

Symptoms	Total	Positive	Borderline	Negative
Symptoms	68	41	3	24
No symptoms or no information	48	9	1	38
Questionable symptoms	19	5	2	12
	135	55	6	74

Classification	Total	Positive	Borderline	Negative
Group I (*a*)	500	74	29	397
I (*b*)	165	68	16	81
Group II	245	11	18	216
Group III	135	55	6	74
	1045	208	69	768

shown in this series under both divisions of Group I. Although there is a tendency towards a higher percentage in the larger babies, it is to be noted that Group I (*b*) are selected cases. During the collection of Group I (*b*) all new-born above 8 pounds were examined, while the smaller babies were excluded, since at that time the impression was that only large babies and those with symptoms should be referred for roentgen examination. In certain families studied all of the children have been large. Two families in particular have had no babies weighing under 9 pounds and all of these were found to have an enlarged thymus.

Mothers with Thyroid History

Practically all of the mothers in the cases tabulated come from this section of the country which is considered a goiter belt. A review of the histories of these maternity patients shows that a large number of the women, when admitted to the hospital, showed an enlargement of the thyroid sufficient to be noted when physical examination was made. Some few had had thyroid surgery, while others had received treatment.

Knowing that thyroid disturbance is more prevalent among females, and finding that the enlarged thymus occurs more frequently on the whole from mothers with an enlarged thyroid than from those with a normal thyroid gland, we arrived at the conclusion that there may be a relation between the two, but there is not enough evidence to prove this to be a fact.

If one is to regard the condition of enlarged thymus as a familial affair, then it must be assumed that the above findings are coincidental and probably due to the fact that the mothers are from a district where thyroid enlargement is exceedingly common.

Age of the Mother

The conclusions drawn from this series of cases is that the age of the mother has no direct bearing on the finding of an en-

larged thymus. This conclusion is contrary to the findings of Miller and Peterson.[11]

NUMBER OF CHILDREN

The primiparae are in preponderance in Group I but we see no reason to believe that there is a probability that the danger of an enlarged thymus increases with each successive child. It is definitely shown that the primipara having a child with an enlarged thymus must be placed in a class likely to have the same condition existing in each succeeding child. The same appears to be true with the finding of a negative thymus.

HISTORY OF FORMER THYMUS

The percentage of positive findings in this class where former children have had an enlarged thymus is startling and it is shown that in some families as many as 4 or all of their children have had such a diagnosis. In collecting this group of infants only roentgen evidence or autopsy diagnosis was considered. There are some, however, who probably should be included in this classification where no such records were available. Histories obtained from parents or physicians pointed out the fact that former children had suffered from the classical symptoms of thymic enlargement and in some cases an unexplainable sudden death of an infant had occurred.

OBESITY IN THE PARENTS

In Group I, one mother weighing 320 pounds had a female child with a positive thymus while another mother weighing 280 pounds had a male child with a negative thymus. Group I (*a*) also includes two mothers weighing over 220 pounds having a negative record for their babies. In Group II the father of a male infant with enlarged thymus weighed 240 pounds. Therefore it would seem that obesity in the parents is not a contributing cause of thymic enlargement.

SYPHILIS

Two mothers who had been treated for syphilis and had had positive Wassermann reactions and several miscarriages, both had children with negative thymus findings.

MOTHERS HAVING HAD A MISCARRIAGE OR STILLBIRTH

Tabulation was also made of the mothers having a history of a miscarriage or stillbirth. The number of positive findings in this group is no higher than among the mothers who had not had such a termination of pregnancy. As the thymus gland has been considered a factor in asphyxia neonatorum[3] it was hoped that some information might be obtained. Nothing was brought out to prove that an enlarged thymus was the cause of premature death in the previous children.

The chart of family records shows 7 sets of twins, 5 sets with a negative thymus in both children, one set with a positive thymus in both, and one set with a normal chest in one infant but with a thymus shadow in the other. There was also found one set of triplets with normal chests in all three children.

The data relative to an enlarged or normal thymus in some of the children of families Numbers 11, 18, 19, 23, 30, and 49 are taken from the autopsy records of these patients.

In the cases where the classification of the family is doubtful, viz., 69, 70, 72, 78, 85 and 88, the oldest children were in Group III, with the exception of family 70. It is shown in the tables of Group III that no positive thymus shadows are recorded after the age of four years. The age of these children when examined may account for the negative thymus finding, as the subsequent children were examined shortly after birth.

There is a complete record of 94 families regarding the thymus gland shadow. This covers the examination of 212 babies of these families. Of these, the husbands of families 92 and 93, 85 and 86, and 56 and 57 are related. The related families are found to be classified the same. In the same series there are also cases of sisters, whose

FAMILY RECORD

Legend: – negative, b borderline, × positive

Family	Class	Thyroid History	Total Children	Child examined 1	2	3	4	5	6	7
1	Neg.	Neg.	5				=	b		
2	Pos.	Neg.	2	×	b					
3	Pos.	Enlarged	2	×	×					
4	Pos.	Neg.	4			b	×			
5	Neg.	Neg.	2	–	–					
6	Pos.	Neg.	4		×	×	×			
7	Pos.	Neg.	2	×	×					
8	Neg.	Neg.	2	–	–					
9	Neg.	Neg.	2	–	–					
10	Neg.	Neg.	2	–	–					
11	Pos.	Neg.	2	×	×					
12	Neg.	Treated	2	–	–					
13	Neg.	Neg.	2	–	–					
14	Neg.	Neg.	3		–	–				
15	Pos.	Neg.	4		×		×			
16	Pos.	Neg.	3		××	×				
17	Neg.	Neg.	2	–	–					
18	Pos.	Neg.	4		×	×	×			
19	Pos.	Neg.	5		×	×	×	×		
20	Pos.	Enlarged	2	b	b					
21	Neg.	Neg.	2	–	–					
22	Neg.	Surgical	5				–	=		
23	Pos.	Neg.	2	×	×					
24	Neg.	Neg.	3		–	=				
25	?	Neg.	4			×	–			
26	Neg.	Neg.	2	–	–					
27	Neg.	Neg.	2	–	–					
28	Neg.	Neg.	2	–	–					
29	Pos.	Neg.	5		×	×	×	×		
30	Pos.	Treated	4	×	×	×	×			
31	Pos.	Neg.	3		×	×				
32	Pos.	Neg.	3	×	×	×				
33	?	Neg.	2	×	–					
34	Neg.	Neg.	2	–	–					
35	Pos.	Neg.	2	b	×					
36	Pos.	Neg.	2	×	×					
37	Neg.	Neg.	2	–	–					
38	Pos.	Neg.	4			b	×			
39	?	Neg.	4			×	–			
40	Pos.	Neg.	4			×	×			
41	Pos.	Neg.	3	×	×	×				
42	Neg.	Neg.	3		–	–				
43	Pos.	Neg.	4			×	×			
44	Neg.	Neg.	2	=						
45	Neg.	Neg.	2	=						
46	Neg.	Neg.	3	–		–				
47	?	Neg.	2	×	–					

Family Record (*Cont.*)

Legend: – negative, b borderline, × positive

Family	Class	Thyroid History	Total Children	Child examined						
				2	2	3	4	5	6	7
48	Neg.	Neg.	2	–	–					
49	Pos.	Neg.	4		×		×			
50	Pos.	Neg.	4	b		×	b			
51	Neg.	Neg.	2	–						
52	?	Neg.	6				b		–	
53	Neg.	Neg.	2	–	–					
54	Neg.	Neg.	2	–	–					
55	Neg.	Neg.	4			–	–			
56	Neg.	Neg.	2	–	–					
57	Neg.	Neg.	2	–	–					
58	Pos.	Neg.	2	×	×					
59	Pos.	Neg.	2	×	×					
60	Neg.	Neg.	2	–	=					
61	Neg.	Neg.	3	–		–				
62	?	Neg.	2	b	×					
63	Pos.	Neg.	2	b	b					
64	Pos.	Neg.	2	b	b					
65	Neg.	Neg.	2	–	–					
66	Neg.	Neg.	2	–	–					
67	Neg.	Neg.	5			–		–		
68	Neg.	Neg.	4			–	–			
69	?	Neg.	2	–	×					
70	?	Neg.	3	–	b	–				
71	Neg.	Neg.	6			–	–	–	–	
72	?	Neg.	3		–	×				
73	Pos.	Pos.	3		×	×				
74	?	Neg.	4			×	–			
75	Neg.	Neg.	3		–	–				
76	?	Neg.	4			–	b			
77	Neg.	Neg.	7				–	–	–	–
78	?	Neg.	4				–	×		
79	Pos.	Neg.	2	×	×					
80	Neg.	Neg.	3	–	–	–				
81	Pos.	Neg.	3		×	×				
82	Pos.	Neg.	2	×	×					
83	Neg.	Neg.	5				–	–		
84	Neg.	Neg.	2	–	–					
85	?	Neg.	2	–	×					
86	Neg.	Neg.	4			–	–			
87	Neg.	Neg.	2	–	–					
88	Neg.	Neg.	3		–	×				
89	Pos.	Neg.	2	×	×					
90	Neg.	Neg.	2	–	–					
91	Pos.	Neg.	3	×	×	×				
92	Pos.	Neg.	2	×	×					
93	Pos.	Neg.	3		×	×				
94	Neg.	Neg.	2	–	–					

babies have been negative, but so far only one child has been born to each.

Summary of Family Records

	Total	Positive	Borderline	Negative
Former children negative	58	5	3	50
Former children positive or borderline	56	44	5	7
	114	49	8	57

Of the 94 families, 36 are classified as having children with thymic enlargement, 45 as negative regarding this condition and the remaining 13 as being doubtful. Of the 36 positive families, there is a history of thyroid disturbance in 4 mothers, while in the 45 negative families there are only 2 with a thyroid history. There is no significant evidence present to substantiate the belief that some underlying relation between the two organs has a bearing on the condition known as hyperplasia of the thymus.

CONCLUSIONS

1. Enlargement of the thymus appears to belong to family groups and the majority of the children in these families exhibit this condition.

2. Roentgen examination is indicated in all children when a history of previous children of that family shows an enlarged thymus.

3. Certain types of thymic enlargement do not decrease in size after irradiation, but the symptoms in these cases subside.

4. There is only unconvincing evidence that there may be a relation between enlarged thymus in the offspring and thyroid disturbance in the mother.

5. The age of the mother apparently has no bearing on the size of the thymus.

6. There is no evidence to show that multiparity has any relation to thymic hyperplasia.

7. Obesity of the parents apparently has no relation to the finding of an enlarged thymus in the children.

8. While there is some evidence that larger babies are more apt to have enlargement of the thymus than smaller ones, this is not enough to limit investigation to the large babies only.

9. The finding of a shadow of an enlarged thymus is slightly more common in females in this series of cases.

10. Enlargement of the thymus does not necessarily indicate that the child will show symptoms.

11. An early diagnosis of the condition is of vital importance.

12. The diagnosis and treatment of an enlarged thymus is a problem of the radiologist.

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ANGIO- (PERIVASCULAR) ENDOTHELIOMAS ABOUT THE JAWS*

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ENDOTHELIOMA is the name given to a group of neoplasms believed to be derived from the lining cells of blood and lymph vessels, lymph spaces and serous cavities. These cells are derived from the mesenchyma of the embryo and are closely related to connective tissue structures, retaining certain potentialities of connective tissue cells yet assuming some of the histological characteristics of epithelial cells.

Borrmann[1] has constructed an histogenetic classification including hemangio-endothelioma, lymphangio-endothelioma, capillary endothelioma, perithelioma and peri-endothelioma. This classification is in general use but presents the disadvantage that not all growths can be accurately classified, because it is not possible to state, with certainty, whether a certain growth arises from lymph vessel or space or blood vessel or capillary. Ewing[2] classifies these growths as perivascular endotheliomas, but this term, *perivascular*, is slightly misleading as their origin is *intravascular*. I have called these endothelial tumors that surround and invade vascular paths, *angio-endotheliomas*.

The origin of the endothelioma in most cases is from the lining cells of small vessels or lymph spaces; from this source the growth proceeds either by extension and invasion or by the continuous transformation of adjoining cells into tumor cells. I am not prepared to take sides on the controversy that exists on the method of extension of endotheliomas as this point is of little importance in the recognition and treatment of these growths.

I do want to emphasize especially that the endotheliomas arising about the jaws do not metastasize even after repeated attempts at surgical destruction. However, after such procedures, the growth is usually accelerated and the cells tend to become more embryonal in type.

This fact, together with their infiltrating character which makes them noted for persistent local recurrence, makes it necessary to treat well beyond the probable margins of the growth. However, it is not necessary to consider the regional lymphatics involved and treat them routinely as with sarcoma or carcinoma.

I wish to report 4 cases of angio-endothelioma that involved the jaws. The point of origin of the growth in Cases I, II and III seemed to be in the foramina of exit from the jaws of blood and lymph vessels. Case IV originated in the inferior dental canal at the apex of the first lower molar.

Inasmuch as all of these cases were misdiagnosed by local pathologists as either carcinoma or sarcoma, it may be well to discuss the histology of these cases in some detail.

The cells of vascular endothelioma are small and cuboidal or cylindrical in shape, staining deeply with hematoxylin. The cytoplasm frequently is not clear and pale as with endotheliomata arising from peritoneal surfaces but contains granular masses which sometimes obliterate the nuclear structure. There can usually be found in some part of the section the typical nucleus, which is characterized by being pale and showing definite darkly staining nucleoli.

"An intimate relation to the supporting stroma is an important structural peculiarity which distinguishes many endotheliomas from epithelial tumors. The cells cling to the walls of spaces in spite of the shrinkage of hardening and the cell bodies may be seen to pass insensibly into the substance of the stroma. Small fibroblasts and fine fibrils may ramify between the endothelial cells. . . . ."

* Read at the Fifteenth Annual Meeting, American Radium Society, Detroit, Mich., June 23–24, 1930.

"The most reliable sign of endothelioma is found in the minute characters of the cells as above described but these characters are lost in many actively growing tumors and in recurrences. Yet a thorough search for the translucent polyhedral cells with pale nuclei, devoid of acidophile nucleoli is often rewarded in tumors the bulk of which fails to show such cell types. . . . . I have never seen definite pearl formation in any undoubted endothelioma. . . . . The desmoplastic properties of many endotheliomas assist in this recognition, and a peculiar form of hyalinosis may sharpen this feature" (Ewing).

It must not be supposed that the microscopic slide will make the diagnosis in all cases, even if it is examined by a good pathologist. He should be furnished with an accurate history and description of the growth. This point is illustrated by Case IV. The section seemingly showed a rapidly developing carcinoma of grade 3. There were many atypical mitotic figures, little evidence of differentiation and definite invasion shown and *the growth had not metastasized even though five attempts had been made to excise it.* The correct diagnosis was made in this case from a section removed at the second operation which showed a relatively slow-growing, benign-appearing angio-endothelioma.

The following 4 brief case reports with photomicrographs of the slides are self-explanatory:

CASE REPORTS

Case I. M. C., female, aged twenty-three, examined Sept. 20, 1923. Diagnosis of section by Dr. James Ewing: Lymphangio-endothelioma.

History. Three months before examination the patient noticed a small red pimple just to the left of the midline in the vault of the hard palate. This had become the size of a large pea and was excised down to the periosteum nine days before my first examination.

Examination showed an area of ulceration of the hard palate about 1.5 cm. in diameter with tiny bright red nodules about the margin. This crater and margin were given 250 mg-hr. of radium in dental compound. There has been no recurrence to date.

Figure 1 shows a lobule of the tumor surrounded by a zone of hyperplastic lymphatic channels. These vessels are already showing the overgrowth of intima with obliteration of the lumen with the perivascular growth of the endothelial cells of the intima. About the lobule is also seen a kind of capsule made up of compressed fibrous tissue. Figure 2 shows a small blood vessel in the tumor surrounded by deformed endothelial cells. Many of these exhibit the pale nuclei with multiple, darkly staining nucleoli which are characteristic of this growth. Fibrils of the connective tissue stroma are intimately interwoven between the endothelial cells.

Case II. A. E., female, aged twenty-four, examined March 13, 1923. Diagnosis of section by Dr. James Ewing: Lymphangio-endothelioma.

History. The patient noticed a small, slowly growing tumor just to the right of the midline of the hard palate one year ago.

Examination. A hard tumor of the vault of the hard palate was found; in size about 2 cm. in diameter, raised about 5 mm. and covered by normal mucous membrane.

Treatment. Four radium needles of 5 mg. each were implanted about the tumor for 13 hours, a total of 260 mg-hr. The growth was excised for diagnosis a few days after the radium was removed.

Figure 3 shows cloudy swelling and thrombosis of the smaller blood vessels. The endothelial cells are growing into and dilating a large lymph space. Figure 4 shows the more minute effects of the radiation on the cells, some of which are pycnotic with deeply staining nuclei; others show beginning disintegration. The blood vessel in the center shows an *intra* and *peri* vascular extension of the endothelial cells of the intima.

Case III. S. S., female, aged thirty-two. Sections were submitted to me for diagnosis after resection of the growth in June, 1928.

History. This growth seemed to arise under the periosteum near the apex of the lower right molar at the inferior dental foramen about three years previously and had been excised twice before this. In April, 1928, before excision, the growth was about the size of an almond. There has been no recurrence to date. This growth shows the typical modification of the cells resulting from the previous treatment and many atypical nuclei are seen. The lobules

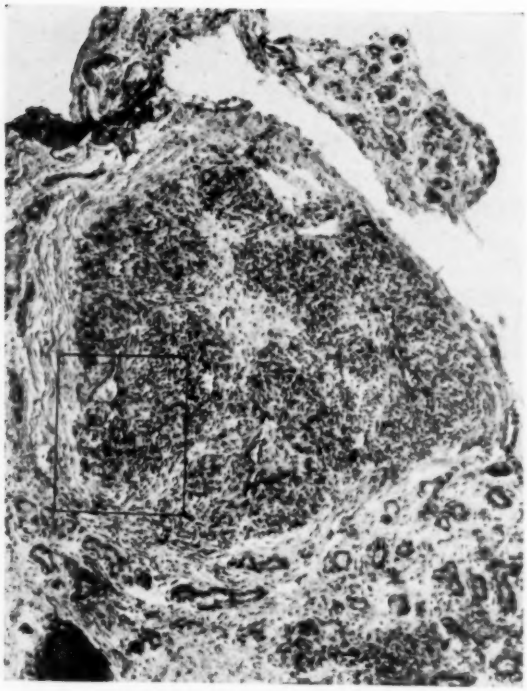

Fig. 1. Case I.

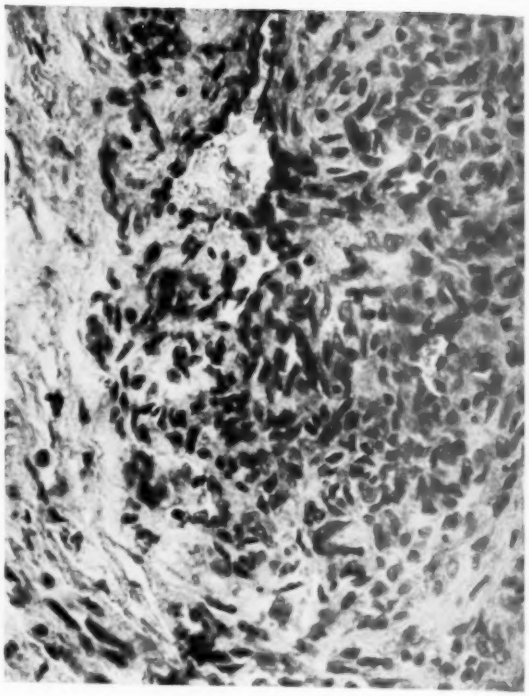

Fig. 2. Case I.

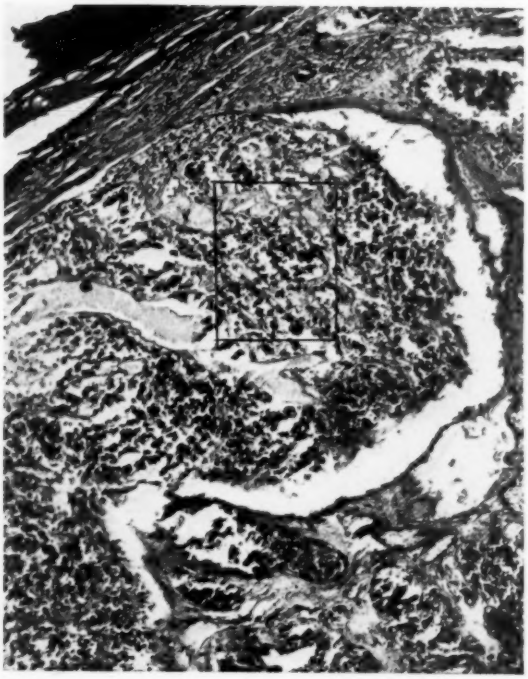

Fig. 3. Case II.

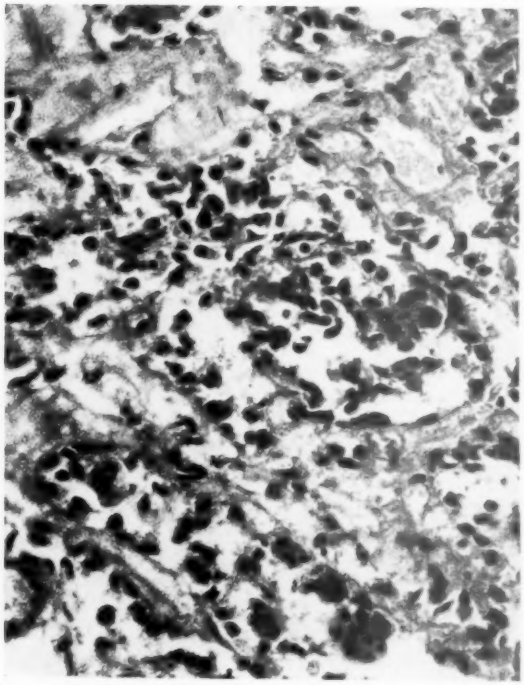

Fig. 4. Case II.

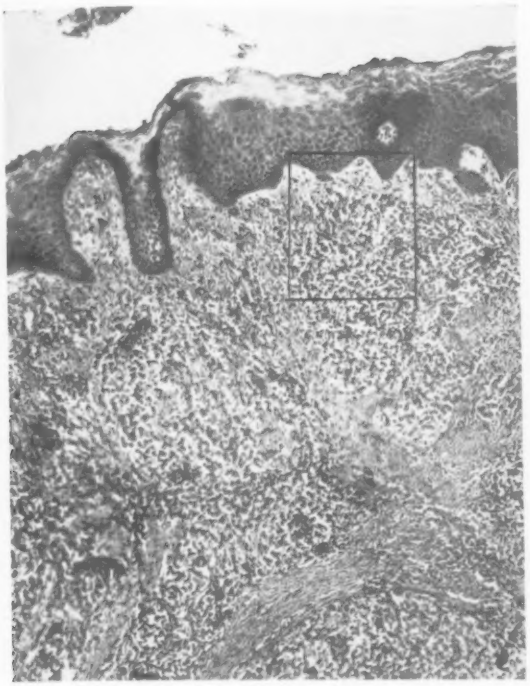

Fig. 5. Case III.

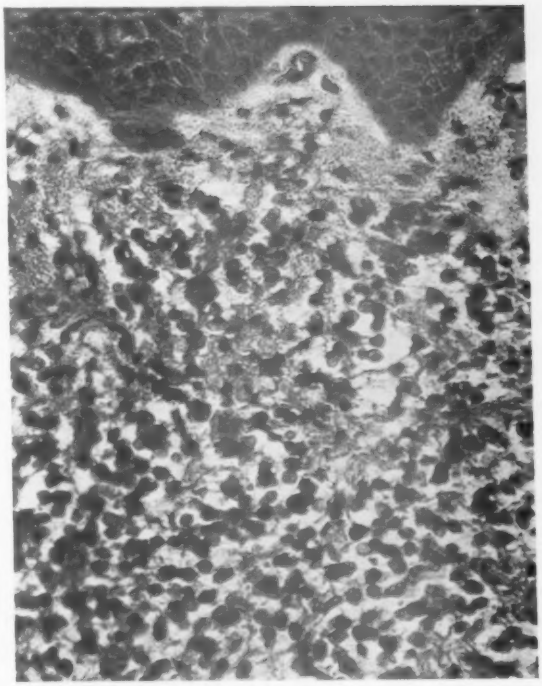

Fig. 6. Case III.

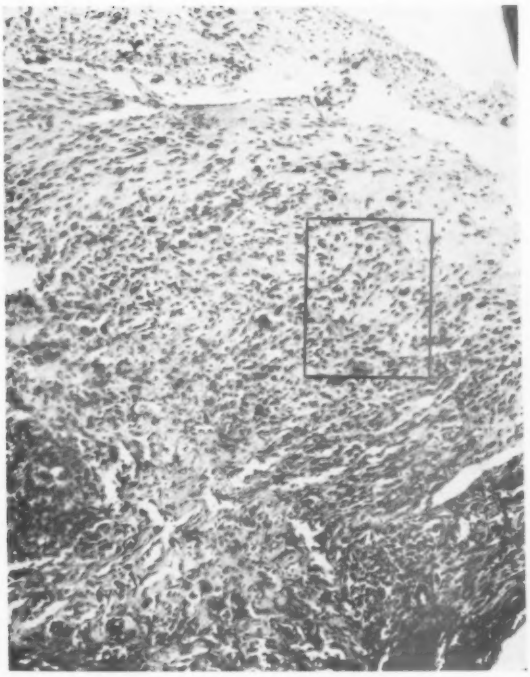

Fig. 7. Case IV.

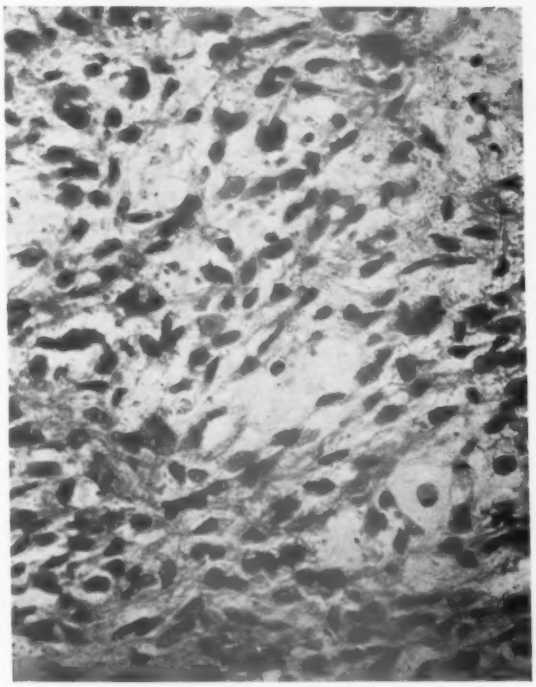

Fig. 8. Case IV.

of the tumor are separated by connective tissue septa and many fibrils of connective tissue can be seen interwoven between the typical endothelial cells which are characterized by large pale nuclei with darkly staining multiple nucleoli (Figs. 5 and 6).

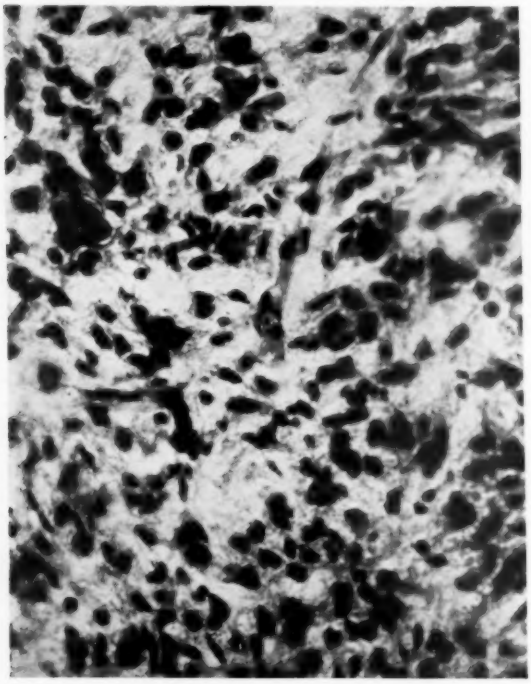

Fig. 9. Case iv.

Note: In this case it would be easy to mistake this growth for an epithelioma as the endothelial cells have grown out to underlie the epithelium.

Case iv (Figs. 7, 8, and 9). Female, aged thirty-seven. Date of my first examination March 15, 1928. First noticed numbness of chin on left in August, 1927. This woman consulted a surgeon who after having made a roentgen examination of the left mandible told the patient she had a cyst of the jaw.

Five surgical attempts at removal of this growth occurring in the inferior dental canal were made between October, 1927, and Nov. 20, 1928, and indifferent and incomplete treatment by radium and roentgen rays was given. The patient could not be controlled but went from one physician to another.

This patient went to the Mayo Clinic on Jan. 1, 1929, and the following paragraph from Doctor Broders' letter of Feb. 9, 1929 confirms my diagnosis:

"I agree with your diagnosis of angioendothelioma. We use the terms angioendothelioma and angiosarcoma indiscriminately. When we use the terms lymphangioma or hemangioma the tumors are understood to be benign, but when we use the term lymphangioendothelioma or hemangioendothelioma the tumors are understood to be clinically malignant in varying degrees. Hemangioendothelioma and lymphangioendothelioma are modified sarcomas."

This patient died of an embolus following a severe hemorrhage March 23, 1929.

SUMMARY

A brief résumé of the clinical and pathological aspects of angio-endotheliomas has been given in connection with the report of four cases arising in the vascular channels of the jaws.

It is especially urged that vigilance be exercised to differentiate these cases of endotheliomas about the jaws. First, because we need accurate statistics, second, because we must acquire a clear understanding of the methods which will produce a retrogression of the malignancy we are treating, and third, because we must conserve all the normal tissue possible, consistent with thorough treatment.

"Finally, it should be urged that the diagnosis of endothelioma should be accepted only when the evidence is clear and conclusive. Otherwise, this group will continue to represent the resting place of miscellaneous tumors on which the data and study have been inadequate" (Ewing).

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DISCUSSION

Dr. R. E. Loucks, Detroit, Mich. Dr. Withers sent me a copy of his paper, which I looked over. I then looked up my records and found my earliest cases, treated when we did not know much about the effect of radium on endotheliomas.

The fact that endothelioma originates from the endothelium of the blood and lymph vessels or the lining of the serous cavities is important but whether this origin is peri- or intravascular is insignificant from the clinical aspect.

The most important observation of the author is that endotheliomata are prone to recur after surgical interference, whether from the knife, cautery or electric needle but that there is no tendency to metastasis. His therapeutic results in three cases are worthy of scientific recognition while the fourth bears out the old maxims that "Procrastination is the thief of time" and that "Too much meddling muddles the outcome."

In reviewing our records, I find that our first case of endothelioma with a pathological biopsy report was treated first in November, 1916, or almost fourteen years ago. It might be of interest to give a brief report of the case.

Mrs. B., aged forty-eight, for two years had noticed a lump within the left cheek. It had been operated upon two months before she came to us; the biopsy report was benign tumor with a cancerous tendency. It returned within a month and was again operated upon, with a biopsy report of endothelioma. The cavity was curetted carefully and packed with gauze. A small rounded nodule the size of a marble was felt within the mucous membrane of the left cheek near Stenson's duct; this was tender to the touch and showed some induration at the lower border.

Treatment. Radium was used two days after the last operation. As the patient had an extra upper denture, this was utilized for holding the radium and protecting the jaw. Several small holes were drilled through the gum of the plate and a 25 mg. tube screened with 1 mm. brass and rubber was laced to the plate; 50 mg. with the same screenage was laid on 1 cm. gauze and held on the skin surface. All the radium was applied for eleven hours, or a total of 825 mg-hr.

The treatment was repeated in two months. Three months after the last treatment, the progress notes read as follows: No difficulty was experienced after the last treatment; the scar in the mucous membrane is smooth, not contracted and only a small nodule like a split pea can be felt.

She was under observation for several years and was last seen a few months ago, at which time no evidence of recurrence was discernible.

A CLINICAL EVALUATION OF RADIUM AND ROENTGEN THERAPY IN ADVANCED CANCER WITH VARIOUS COMBINATIONS OF WAVE LENGTHS*

A PRELIMINARY REPORT

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PHILADELPHIA, PENNSYLVANIA

THE progress of radium and roentgen therapy must depend upon the development of physical principles and techniques which permit the delivery of greater quantities of radiation to the tumor areas. Much of the success in the future will depend upon the radiologist's ability to develop some means of administering still greater quantities of radiation to the tumor site, of sufficient intensity to destroy cancer cells of various types, and still preserve the integrity of the healthy tissues.

The physicist and biologist are indispensable to this work. Many animal and laboratory experiments are illuminating and explain many diverse phenomena, but not all of these conclusions are readily amenable to clinical application.

If the same "strains" of human beings made up our clinics, if disease in the same anatomical locations of equal duration and extent of involvement could be estimated, if the age and physical condition and the frequent other complicating diseases could be readily and accurately weighed and measured, if and when the type and grade of malignancy according to cellular differentiation is uniformly and accurately standardized and universely adopted, then it might be possible to make some adjustments of these correlated facts with laboratory manifestations, and possibly some firm scientific basis for irradiation of different types of cancers could be evolved.

The value of radium and roentgen rays is indisputable in early cancers of the skin, mouth, breast and cervix uteri. These agents become ever more indispensable in the late cancers of the skin, mouth, breast and cervix uteri, as well as in other advanced and late cancer cases, because in these advanced stages there is no other procedure that offers any hope or benefit.

The late cases are in the majority; they become a burden to their families and communities so that the social and economic problems, aside from the hospital taxations, are of serious importance.

The early skin, mouth and cervix lesions have been amenable to a manifold variety of techniques in experienced hands. The advanced cancers have shown sufficient improvement in some instances to justify intensive irradiation when the physical condition of the patient permitted, not only from the standpoint of relief of pain, but for actually prolonging life. One cannot mathematically estimate this value except by clinical impressions and comparisons with an experience of large groups of cases, where every advantage of systematic irradiation has been carried out to the limit of skin and physical tolerance.

Cancers of the gastrointestinal tract, particularly the adenocarcinomas of the rectum are resistant to radiation. Adenocarcinomas of the cervix are likewise vulnerable. Postoperative irradiation of cancer of the breast with axillary involvement has shown sufficiently improved end-results over surgery alone to justify its use routinely (Pfahler and Widmann[21]). Irradiation of advanced cancer of the

* From the Radiological Department of the Philadelphia General Hospital, Philadelphia, Pa. Read at the Thirtieth Annual Meeting, American Roentgen Ray Society, New York City, Sept. 17–20, 1929.

breast in some instances has been beneficial when extended over a period of eight to twelve weeks. Many of these advanced and inoperable cases are made operable by this prolonged irradiation, and statistics[23] show a decidedly increased longevity cycle.

Broders,[2] Ewing,[6] Greenough,[9] and Schmitz, Hueper and Arnold,[29] have successfully graded some cancers according to their cellular differentiation, and statistical tables are now substantiating these observations of varying degrees of malignancy for different tumors by microscopic determination.

Advanced cancers of the mouth, breast, cervix, uterus, bladder, prostate, rectum, etc., even with gland and bone metastases, have shown such a variability of reponse to irradiation that it is clearly evident that there is a definite radiosensitivity of different cancers.

Healy and Cutler[10] brought out the striking paradox that with radiation treatment the prognosis is better with the higher grades of malignancy because the radiosensitivity increases with the malignancy. They divide cervical cancers into three groups: squamous, transitional, and anaplastic. With the squamous type there were few cures by any method and only in the early stages; in the intermediate group the results were about equal from surgery and irradiation, while in the anaplastic group there were no cures by hysterectomy, but the highest proportion, 46 per cent, by irradiation. Ewing[6] regards this as a forceful demonstration of the value of grading epidermoid cancer according to malignancy and radiosensitivity.

There is still considerable danger in planning treatments on the basis of variable intensities of radiation according to the malignancy grading. Not all pathologists will agree on the extent of cellular differentiation. The question is further complicated by the duration of the lesion and the site of the growth from which the specimen is taken.

This does not lessen the clinical impression of variable tumor sensitivity, but the fact is pointed out to show the advisability of planning radiation treatment on the basis of the limit of skin tolerance and also in accordance with the physical condition of the patient. This is an important factor to be considered in the advanced cases, many of whom are fairly advanced in years. The microscopic grading of cancer in the advanced or late case is probably not important.

So-called acquired resistance to radiation following repeated inadequate dosage is a very general and noteworthy observation. An important factor that renders tumors resistant is their tendency to produce growth of connective tissue. Highly vascular tumors frequently disappear quickly. Complicating infections interfere with successful irradiation.

The general physical condition of the patient probably regulates more than any other single factor the final end-results of irradiation. The constitutional element of a natural body reaction must be considered in tumor radiosensitivity. Good results are rarely to be expected in the weak, anemic and cachectic individuals, whereas a fresh subject in good health, normal blood count and excellent physical endurance may show an extraordinary response for the same extent and type of a given anatomical involvement. These factors complicate rule of thumb procedures for the radiation treatment of advanced cancers.

There is a fairly general agreement that the effect of irradiation is a direct one. Sharply localized treatments to metastatic skin nodules show responses that indicate this effect. Investigations by Regaud[26], Lacassagne[15], Wood[33], and Holthusen[13], support this contention. While there are many noteworthy observations to suggest an indirect action, there is little uniformity of agreement and the postulations are largely theoretical, and many of the deductions made from animal experiments are confusing and conflicting.

The proper working out of the time distribution of irradiation and an adminis-

tration of a greater quantity of radiation with preservation of normal structures, are factors of great importance if further progress in the radiation treatment of advanced cancer is to be attained.

There are few data, clinical or experimental, to substantiate a selective action by a specific wave length. It has been frequently observed on the basis of clinical observations, that radium shows responses strikingly superior to roentgen rays, in skin and intraoral cancers, and particularly for treatment of metastatic nodules of the neck and skin in mouth and breast cancers. This determination may or may not be an impression of an enthusiast for a particular technique. The element of an individual appraisal may be tempered by technical facilities or the established routine of a particular organization.

Regaud has held for many years that cancer tissue shows a selectivity for specific wave lengths. This is in accord with the experimental work of Russ,[27] and Dognon[5]. In 1924, Wood[32] showed by animal tumor experiments that there was no difference in the lethal effect of long and short wave length radiation. Since the depth dose is largely a function of the wave length, the question of how short a wave length can be to obtain an adequate and satisfactory depth dose is of utmost importance from the standpoint of the maximum skin tolerance dose and the clinical result. Failla[7] believes that if the lethal dose is independent of the wave length, as Wood observed in animal tumors, then further observations on the effect of different wave lengths on human tumors is not essential.

The premise for such a clinical study seems to be all the more justified by virtue of Wood's observations that the biological effect on animal tumors was the same with unfiltered, filtered, or gamma radium rays when the same number of human erythema doses was applied. A depth dose with unfiltered or low filtration, whether of radium or roentgen rays, must fall short of the depth intensities obtained by higher filtrations and shorter wave lengths of radium and roentgen rays.

According to Holthusen[14], the absorption changes with the wave length according to a change in its penetrative power, and all the effects of the rays are absolutely independent of wave length. He finds that the biological effect is parallel to the ionization in air. This is in complete agreement with Wood[33], and Chamberlain[4], that 500 r is identical for all wave lengths.

Lacassagne[16] supports the theory of a specificity of wave lengths for certain cancer cells. He is opposed to the practice of employing radiations of qualities that are caustic in their effect and argues for the elective action of roentgen and gamma radiation. Lacassagne believes that if a caustic effect is desired, then chemical and physical agents are just as effective and less dangerous.

Strangeways and Hopwood[3] studied tissue cultures for specific effects of different wave lengths of roentgen rays and found the long wave length rays nearly 40 per cent more efficient than the short wave length rays. The difficulties of measuring the back-scattering and the factors of secondary radiation in deep-seated tumors in actual practice cannot be readily adjusted to this conclusion.

Wood[34] has found that 50 per cent of gamma rays and 50 per cent of roentgen rays makes a 100 per cent lethal dose on the eggs of *Drosophila*. His experiments do not indicate an electivity of sensitiveness to different qualities of rays. The radiation factors at varying depths cannot be estimated and correlated for clinical comparisons from these studies.

It is generally considered that roentgen therapy with filtrations beyond 0.5 mm. of copper, with 200 kv., only increases the time of the dose and does not admit of qualities of radiation of any superior therapeutic value. This same attitude has been held to a great extent with regard to radium filtration greater than 2 mm. of brass or the equivalent and more generally used filters of 0.5 mm. of silver and 1 mm. of

brass. Any filtrations greater than these only increase the time of an effectual therapeutic dose according to general beliefs.

This widespread conception is based upon an almost fairly unanimous agreement of physical findings on the basis of our present systems of ionization measurements. In the light of our present knowledge, these can be regarded as fairly accurate, and disagreements are not so much at variance because of actual differences as to the physical factors obtained but rather a lack of agreement as to the proper interpretation of these phenomena.

The German literature indicates a very general use of copper and zinc filters ranging from 0.5 to 2.0 mm. in thickness with high voltage roentgen therapy (200 kv.).

Regaud,[26] Forssell et al.,[8] and Pfahler,[20] are now advocating heavier filters for radium, ranging from 0.5 to 2.0 mm. of platinum. In addition to the increase of filters, Regaud advocates prolonged treatments with low intensities of radium extending in some instances over periods of five to ten days, in order to obtain a uniform effect of irradiation on all cells of a neoplastic area at varying stages of mitosis. Lacassagne and Monod, and Canti[3] demonstrated very conclusively the effect of irradiation at the stage of mitosis. This sensitivity of cells to radiation during the process of division has been studied exhaustively by Alberti and Politzer,[1] Nather and Schinz,[19] Hertwig,[11] Markovits,[17] Mohr,[18] and others.

The clinical results obtained by the use of heavy filters, with both radium and roentgen rays, justifies the longer time necessary to deliver an adequate treatment, according to the statistical reports of the Radiumhemmet, Stockholm,[8] and the Curie Institute of Paris.[26] These improved results are in accord with our experience in the treatment of advanced cancer with the gamma rays of radium.

Canti, Spear and Hopwood[3] in their investigations as to whether it would be better to apply a large intensity of radiation for a short time or a small intensity for a long time, observed from tissue culture experiments that on increasing the distance and thus diminishing the intensity, a longer time was required to produce the cessation of mitosis than would be expected if the action were purely physical, like that of rays on a photographic plate. They further observed that beyond distances of slight intensity, no cessation of mitosis took place, however long the radium was left *in situ*. Interstitial irradiation showed no disappearance of tumor outside a certain radius, no matter how long the radium was left *in situ*.

We have not been able to adjust our doses with heavy filtrations to a satisfactory interpretation of the ionization factors.* The so-called erythema dose with 0.5 mm. of copper and 200 kv. is based upon the estimation of the "threshold erythema" of Quimby,[24] which will produce a redness or bronzing in about two weeks in the majority of cases—about 80 per cent. Our erythema dose represents 800 r as calibrated by a Wulf ionometer. The operating factors for the roentgen equipment are repeatedly checked as well as controlled by a constant reading of an ionization chamber.

With 1 to 2 mm. of copper and 200 kv., the so-called erythema approximates the time and intensity of the skin reactions seen with radium filtrations approximating 1 to 2 mm. of platinum. This quality of radiation will produce a delayed skin reaction or erythema appearing as a faint redness or blanching at about the twenty-first day and showing a decided progressive intensity during the succeeding ten to fourteen days, and rapidly fading to a deep bronzing of the skin at the end of a month.

The reaction caused on the skin and in the tumor apparently depends not only on the amount of energy absorbed by the tissues, but upon the particular wave

* The application of physical factors to the skin reactions from the short wave length roentgen rays and gamma rays of radium will be submitted in detail in a separate publication.

lengths of the radiation. Russ and Scott[28] showed that if the skin of a rat was exposed to a beam of roentgen rays limited to wave lengths ranging from 0.45 to 0.30Å, a definite change subsequently occurred in the hair and skin, with a progressive increase of this reaction as the dose was increased. When the wave length was diminished to 0.168Å, much the same effects were produced, but not until six times as much energy had been absorbed. Similar phenomena were observed when tumors were exposed (Jensen's rat sarcoma), but to cause the same effect with two groups of wave lengths only 2.6 times as much energy of the short wave length had to be absorbed. Russ found that when the wave length is shortened to about 0.1 Å, only 0.75 of the permanent depilation dose is needed to kill the tumor cells. He concluded that it must be more satisfactory to use short wave length radiation for subcutaneous growths, not only because of their greater penetrating power but also because of the change in the right direction of the differential factor.

During the past year much of the treatment at the Philadelphia General Hospital involved heavy filtrations and in many instances combinations of different qualities of rays, both radium and roentgen rays. For economy lead is used for the radium pack filters as well as other surface applications when heavy filtration is deemed advisable.* The glass capillary tubes filled with radon are delivered to the department in silver tubes of 0.5 mm. wall thickness. These are inserted into lead capsules of 3 mm. wall thickness. The densities of these metal filters are approximately equivalent to 2 mm. of platinum or gold. With this filtration, 100 mc., plaque area 10 x 15 cm., 4 cm. distance, will produce an erythema in about 144 consecutive hours of irradiation, or 15,000 mc-hr. This total skin dose will produce a mild erythema in about twenty-one days and fade to a bronzing of the skin in another ten days. The skin toleration is much greater for the short wave length rays, particularly when the treatments are divided over a period of four to six weeks.

A rough estimate of the time difference is apparent when we compare the above dose which is a filtration equivalent to 2 mm. of platinum to the dose of 6,000 mc-hr. when 2 mm. of brass is used as a filter for the same area and distance. Approximately 60 per cent greater intensity is attained with the heavier filter. The density of 2 mm. of brass is 17; the atomic weight of 0.5 mm. silver, 0.25 mm. copper, and 3 mm. of lead is 40.45; this makes the ratio about 2.4 to 1. The 60 per cent increase in time is proportional to our ionization measurements. When the treatments are divided over a period of four to six weeks the skin will tolerate about 2.5 times the intensities that may be given with the usual filtrations of 2 mm. of brass.

For example: All cases of intraoral cancer are routinely given a total of 30,000 mc-hr. of gamma rays to both sides of the neck, divided into 4 or 6 applications of forty-eight hours each with one or two day intervals, according to the condition of the patient. If gland involvement is present at the start of treatment, 8 forty-eight hour packs (4 for each side of neck) are given within four to six weeks. This means a prolonged irradiation over a period of 384 hours, or a total dose of approximately 40,000 mc-hr. of irradiation to both sides of the neck. Occasionally treatments are extended beyond six to eight weeks in advanced cases. As much as 30,000 mc-hr. has been given to one side of the neck, making a total irradiation of 60,000 mc-hr. to both sides of the neck.

The routine pack contains ten radium points, 10 x 15 cm., 4 cm. distance, filter 0.5 mm. of silver and 3.0 mm. of lead. The capsules are fixed in position on a plate of copper 0.25 mm. thick. This total filtration is equivalent to the value of 2 mm. of platinum.

Divided treatment over this period of

* The densities of the common radium filters: brass 8.5; copper 8.9; silver 10.5; platinum 19.3; lead 11.0; gold 21.4; 0.5 mm. of silver and 3 mm. of lead are approximately equivalent to 2 mm. of platinum or gold.

time makes the estimation of the time appearance of an erythema difficult. From the start of the treatment, the first skin reaction or blanching is usually seen about the fifth week. This frequently progresses to desquamation but practically always disappears in ten to fourteen days, with marked bronzing and pigmentation.

The skin is decidedly more tolerant of gamma radiation (filtrations equivalent to 2 mm. of platinum) because frequently treatments have been carried on over periods of eight and ten weeks with total doses ranging from 60,000 to 70,000 mc-hr. about the neck and pelvic regions without any appreciable skin reaction.

The time factor of our high voltage technique, for an erythema, with 200 kv., 0.5 mm. of copper, 2 mm. of aluminum, 50 cm. distance, field 20 cm. sq., is 400 ma-min. (water-cooled tube mechanically rectified equipment). This represents 800 r. A treatment is controlled throughout by a constant reading of an ionization chamber[30] fixed to the tube stand and immediately in the central beam of the rays. The skin erythema dose increases for our equipment as follows: 0.5 mm. Cu + 2.0 mm. Al, S. E. D. = 400 ma-min.; 1 mm. Cu + 2 mm. Al, S. E. D. = 600 ma-min.; 1.5 mm. Cu + 2.0 mm. Al, S. E. D. = 706 ma-min., and 2 mm. Cu + 2 mm. Al = 950 ma-min.

As the filtration progressively increases above 0.5 mm. of copper, the ionization measurements become difficult and uncertain to interpret. Holthusen[12] found comparative measurements of roentgen rays of different wave lengths difficult and impractical in the light of our present knowledge, because of the heterogenous mixtures of radiations of varying hardness.

The erythema value or skin tolerance dose for various combinations of roentgen-ray filtrations of copper, 0.24 mm. to 2.0 mm., have been controlled by observations of several thousand doses. This value has likewise been checked for the gamma radium pack treatments (filter, 2 mm. platinum) on more than 300 cases.

In order to establish some working basis to further improve end-results of the so-called advanced cancers, an attempt was made to study the limit of skin tolerance for different qualities of roentgen rays, with 0.5, 1.0, 1.5 and 2.0 mm. of copper, and the combination of these factors with gamma radium rays (filter, 2 mm. platinum).

Every case of advanced cancer that was physically fit to stand intensive irradiation was routinely treated.

All intraoral cancers with metastasis, and all cases of cervix, rectal, and prostatic cancer received gamma radium pack treatments in conjunction with roentgen rays (200 kv. and 0.5 mm. copper).

All ambulatory mouth cases were routinely given a combination of roentgen-ray wave lengths, with 0.5, 1.0, 1.5 mm. and sometimes 2 mm. of copper filtration through the same skin ports.

Experience has shown that large doses of radium and roentgen rays combined on the same skin area can be administered without serious skin damage. Quimby[24] determined the erythema value of "soft" and "hard" radium rays for a single treatment. (Filters: (a) 0.16 mm. of brass and 1.2 mm. of rubber; (b) 0.5 mm. of silver, 1 mm. of brass and 2.4 mm. of rubber). This investigation revealed that a radiation dose estimated by the erythema effect, required two-thirds of a dose of "soft" radiation to be followed immediately by two-thirds of a dose of "hard" radiation, or vice versa, in order to produce the same erythema as one full dose of either.

Quimby and Pack[25] further elaborated this study by combining roentgen and radium rays to the same field at the same sitting.

They found that a combined dose of 134 per cent was necessary to produce a threshold erythema in 80 per cent of the cases. The factors were: roentgen rays (kenotron) 165 kv., 3 ma., 0.4 mm. Cu, 1 mm. Al at 50 cm. distance, area 3 × 3 cm.; radium, 0.5 mm. of platinum, wood and rubber at 1 cm. distance. Region, anterior surface of the thigh. No physical

means of measuring radiations were employed by Quimby and Pack because it has not yet been shown that physical reactions are proportional to ionization, or to any other physical phenomenon over the range of radiations considered.

It seemed reasonable and safe to first determine the erythema or skin tolerance dose of different combinations of wave lengths on the basis of preliminary skin tests. This information was then carried through an experience that embraced the routine treatment procedures for most of the advanced intraoral and pelvic cancers, with the following conclusions:

We found that a total of 130 per cent skin erythema dose could be administered at one sitting, if the roentgen-ray qualities from 0.5 and 1.0 mm. of copper, 200 kv. (800 r = S. E. D.) were employed in equal amounts of 65 per cent each (area 10 × 15 cm.).

The skin toleration was decidedly increased with copper filtrations above 1 mm., i.e., 1.5 mm. and 2.0 mm. of copper (area 10 × 15 cm.).

We also found that a total of 140 per cent S. E. D. could be given at one sitting with combinations of roentgen-ray qualities from 0.5 mm. of copper and 1.5 or 2 mm. of copper and 200 kv., with equal amounts of each wave length (area 10 × 15 cm.).

Because of our multiple field technique[31] and the protracted course of treatments extending over periods of four to six weeks with multiple divided doses, a saturation of the depth dose at the tumor site could be maintained with little or no appreciable reaction on the skin. Saturation curves[22,31] facilitate dose calculations and tend to further a systematic routine of planning treatments with some relative uniformity.

In a previous communication,[31] we showed many combinations of skin erythema doses that during three to four weeks would achieve total intensities of 200 per cent in the tumor area without exceeding a total of 150 per cent on the skin by the four field technique in pelvic cases. This procedure maintained a saturation of 100 per cent in the tumor without exceeding a saturation of 75 per cent on the skin.

The clinical observations of several thousand doses according to this routine indicates a procedure that will admit of greater quantities of radiation with preservation of the skin and is readily applicable to the depleted physical conditions of advanced cancer cases.

In 173 cases a combination of gamma radiation packs (10×15 cm., 4 cm. distance, 0.5 mm. silver and 3 mm. lead) was used with roentgen rays (200 kv. and 0.5 mm. copper). During four weeks six 20 per cent doses of roentgen rays and four gamma radium packs of 5000 mc-hr. each could be administered to a given skin portal. A total of 20,000 mc-hr. with these factors is equivalent to 125 per cent of an erythema dose. The combination of roentgen and radium rays of these qualities permits a total of 225 per cent of an erythema dose in a period of four weeks to a given skin portal.

The divided dose technique is particularly adaptable to the advanced cancer case, not only for the benefits of the prolonged irradiation during the different stages of cell division, but because these patients are potentially sick, and the dangers of systemic shock must be guarded against by the observations of an experienced radiologist.

The clinical results in 154 cases of advanced cancer have been carefully noted over a period of ten months. The anatomical regions involved were as follows:

Intraoral (lip, cheek, tongue, tonsil, floor mouth) (with bilateral cervical metastasis, 37)	52
Breast, inoperable	7
Breast, inoperable with bone metastasis	4
Bladder	7
Cervix, inoperable—extensive pelvic infiltration	47
Larynx with cervical gland metastasis	11
Prostate	6

Prostate, with bone metastasis	3
Rectum	17
Total	154

Obviously only clinical impressions of improved results can be estimated in an evaluation of these late cases, with an observation that covers only ten months. The importance of the work to date has been the accumulation of clinical data and the development of techniques that permit the administration of greater intensities of radiation to the extent of two to three times the quantities we have previously used routinely.

The grade of malignancy according to cellular differentiation could not be obtained in all cases, because 67 cases had biopsies done in other institutions and were not so graded. Eighty-one cases had previous treatment elsewhere. All cases were frank late or advanced conditions.

The criteria for estimating "improvement" were the maintenance of good health and strength in already advanced stages of the disease, and a reduction or disappearance of the tumor mass or metastatic glands or both.

The reduction of metastatic cervical glands in intraoral cancer was decidedly uniformly better. In 5 cases the glands of both sides of the neck completely disappeared. In 3 of these cases there is evidence of recurrence. In 17 cases the bilateral gland reduction was incomplete, but so pronounced that it must be weighed an achievement in the light of the extent of the original involvement. In 30 cases the improvement was not sufficient to regard as significant. Ten months' observation is not sufficient to make comparative estimates of the degree of fibrosis as compared to this process with longer wave length radiations. In 3 cases with marked fibrosis after prolonged irradiation before admission to this service, there was a decided further reduction in the size of the masses.

Of 11 laryngeal cases with bilateral gland involvement, one case with extensive involvement showed complete recession of all palpable evidence of disease and almost complete disappearance of the intralaryngeal involvement. A progressive recurrence developed ten weeks after irradiation was discontinued. Three postoperative recurrences are apparently arrested. In 7 cases the treatment was insufficient due to complicating toxemia and weakness.

Some of the most intensive treatments given have been to the neck regions. In only a few instances was throat irritation or soreness noted.

Of 7 bladder cases, 5 were symptom-free after a single series of treatments. Equally good results have been observed with 200 kv. and 0.5 mm. of copper, but treatments invariably were followed by more tenesmus. Recurrence of bleeding and tenesmus eight to twelve months after apparently successful heavy irradiation frequently meets with little or no response to further irradiation. In 2 such cases, combined gamma radium packs using 125 per cent S.E.D. (2 mm. platinum filter), applied to the anterior abdomen, plus 120 per cent S.E.D. of roentgen rays with 200 kv., 0.5 mm. copper and a four field technique (the two anterior fields representing the single skin port for the radium pack) were given in four weeks. The clinical results were comparable to the 5 cases with a good response after the first series of treatments.

The results in the breast, rectal and prostatic cases are difficult to evaluate. In some of these cases treatments have been carried on intermittently over periods of five and six months. In some instances totals of 400 per cent of an erythema dose have been attained on the same skin portal without deleterious effects. Equally good physical conditions have been maintained in other cases of like involvement with the generally used high voltage technique. We anticipate that a subsequent report on the longevity cycle of these cases will show the advantage of the greater intensities of radiation given.

Of the 47 advanced cervical cancers with widespread pelvic involvement, only 23 cases are living after ten months. In 11 cases the improvement was so marked that there is little question in our minds of the superior benefits from combined wave length radiation. One case with a rectovaginal fistula and marked pelvic infiltration and cachexia, is clinically free of disease—now four months. Five cases have remained stationary as to the extent of involvement and general health. Six cases have failed rapidly.

These observations of improvement are significant even though the results are transitory and embrace a period of time less than a year. The combination of various short wave length roentgen rays (200 kv.) in conjunction with gamma radium rays insures the delivery of greater intensities of radiation to the tumor site, and particularly with multiple skin portals, than any other technique in our experience.

If there is no selectivity of certain types of radiation to certain cancers then radiation therapy has manifestly reached its limitations for good. Unless radiologists are to fall short of accomplishing a good proportion of success in the more advanced types of cancer cases still in good physical condition, then some concerted effort to build up still greater intensities of radiation in the tumor areas, and preserve the integrity of the normal tissues must be fostered and developed.

SUMMARY AND CONCLUSIONS

1. Clinical experience indicates that certain cancers are radiosensitive and radioresistant.

2. Highly cellular cancers are extremely malignant and also very radiosensitive.

3. The future success of radiation therapy of advanced cancer must depend upon the development of some means that will permit the administration of greater quantities of radiation than are generally used and still preserve the integrity of the normal tissues as well as the general health of the patient.

4. The "skin erythema dose" or skin tolerance should be standardized by systematic and repeated ionization controls. A constant reading "ionization system" is ideal for this purpose. Each radiologist should know the milliampere-minutes dose equivalent to a given number of roentgens for his particular machine. We have found 800 r to be a safe erythema dose from an experience of more than 15,000 doses of roentgen rays.

5. Prolonged irradiations, according to Regaud, are indicated by the improved radiation effects at varying stages of cell division as observed experimentally and clinically.

6. Clinical results point to a selective action of gamma radium rays (with filtration equivalent to 2 mm. of platinum).

7. Combinations of different short wave lengths of roentgen rays (200,000 volts; filtrations: 0.5, 1.0, 1.5, and 2.0 mm. of copper or zinc), or in conjunction with gamma radium packs to the same skin area will increase the skin tolerance for radiations 30 to 40 per cent.

8. The combination of the shorter wave length radium and roentgen rays with a multiple skin port technique, offers a safe approach to a method of administering two to three times the depth intensities of radiations that are generally obtained, without deleterious effects to the skin or the general well-being of the patient.

9. Clinical impressions justify the inference of improved end-results in advanced cancer by the systematic application of combined short wave length radium and roentgen rays.

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A ROENTGEN SIGN OF PLUMBISM

THE LEAD LINE IN GROWING BONE*

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GRACE S., aged two years, was admitted to the Children's Hospital on Aug. 6, 1929, on account of vomiting which started two days before entry, preceded by a generalized convulsion. The history was important only in that ever since ten months of age the parents were unable to prevent her from eating all kinds of foreign material including paint from the furniture. Physical examination was quite negative except for a moderate pallor and rachitic beading of the ribs. Blood studies showed a moderate anemia but no definite stippling. The clinical diagnosis was "probable lead poisoning and rickets."

Roentgenograms of the extremities showed marked flaring of the ends of the long bones with an unusually dense zone at the ends of the diaphyses (Fig. 1). The question arose as to whether this density was due to healing rickets alone or whether lead poisoning was in part accountable. These findings were discussed with Dr. Louis Diamond, who had referred the patient and it was agreed that he would send any subsequent cases suspected of plumbism for roentgen study.

FIG. 1. Lead poisoning in a rachitic child.

FIG. 2. Roentgenograms of the case reported with lead-calcium determinations.

The next case of clinical lead poisoning, R. G , was a boy two years and four months of age, admitted Sept. 6, 1929, with a history of paint eating for over a year. During that time he had many vomiting attacks, associated with abdominal colic and constipation. On examination he was pale and irritable but seemed drowsy when undisturbed. Blood studies showed a moderate secondary anemia and many stippled cells. The spinal fluid was clear showing no increased pressure or cells but there was a definitely increased globulin content.

Roentgenograms of the extremities showed a broad zone of increased density at the ends

* From the Roentgenological Department of the Infant's and Children's Hospitals, Boston, Mass.

of the long bones which shaded off gradually into the adjacent cortex for approximately 0.5 cm.

These findings seemed to warrant further investigation so the hospital diagnostic files were then consulted and 4 recorded cases of lead poisoning found on which roentgenograms of the chest or extremities had been obtained. Three of these showed the dense zone at the ends of the long bones distinctly, but had been passed over previously as probably indicating healed rickets. The other one in which there was some question as to the correct clinical diagnosis, did not show anything definitely abnormal.

Our faith in the significance of these findings was very much stimulated by a paper read by Dr. E. A. Park, before the Eastern Society for Pediatric Research, May 3, 1930. He has observed this dense line in 6 cases and thinks it may be the most constant sign of lead poisoning in children.[3]

Fig. 3. Same as Figure 2.

During the past year 8 cases of clinical lead poisoning have been admitted to the Infant's and Children's Hospitals, all of whom have had films of the extremities and chest while some of them had examinations of the entire skeleton. A constant finding was the dense zone at the growing edges of the bones which was usually evident adjacent to any epiphysis but most marked at the ends of the long bones of the extremities and at the anterior ends of the ribs.

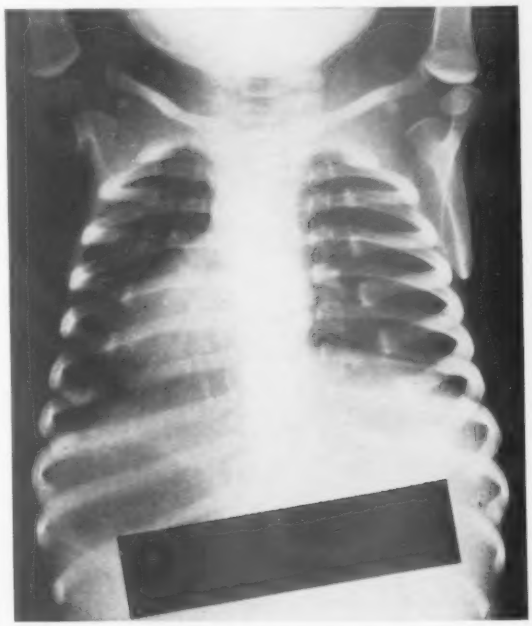

Fig. 4. Same as Figure 2.

A case of more than usual interest was an infant girl, J. W., seven months of age admitted June 27, 1930, with the chief complaint of vomiting for three weeks. She had been breast fed till six months of age and then put on a whole milk formula. She had received orange juice since five months of age and viosterol for the last two weeks. Nothing unusual was revealed on physical examination, but there were many stippled cells in the blood smear. Spinal fluid was obtained under increased pressure and contained increased globulin and 20 cells.

On the roentgenograms there was a very dense band at the ends of the long bones, which

when considered with the clinical picture was obviously due to lead poisoning. However no source of lead could be discovered and the mother denied using lead nipple shields which was the case with another infant in the ward

Fig. 5. A case of lead poisoning four months after treatment was instituted. Note double lines of increased density.

at the same time. Treatment was started but the baby did poorly and died on the third day in the hospital.

At necropsy the brain was quite edematous and death was ascribed to lead encephalitis. The right femur was removed and sent to the laboratory of Dr. Joseph C. Aub for chemical analysis. Sections of this bone were taken from three different areas for lead and calcium determinations. The results are listed in Table I.

As shown by Table 1 the lead was deposited in inverse ratio to the calcium. The zones of greatest density on the roentgenograms contained less calcium but 4 times as much lead as the cortex. Therefore, it seems evident that the opacity was due to lead.

Table I

Results of Chemical Analysis of Sections from the Right Femur

Area	Weight of bone	Total lead	Lead per gm. bone	Calcium per gm. bone
Cortex (A)	3.605 gm.	0.442 mg.	0.122 mg.	0.202 gm.
Medullary spicules (B)	2.860 gm.	0.510 mg.	0.178 mg.	0.133 gm.
Dense areas from ends of bone (C)	3.652 gm.	1.923 mg.	0.527 mg.	0.124 gm.

Discussion

Dr. Joseph C. Aub and his coworkers[1] have shown the close relationship between calcium and lead metabolism. In the body these elements are influenced by the same factors, and storage is for the most part in the skeleton. As might be expected, precipitation is more rapid in the growing ends of the bones.

Since calcium and lead are both relatively opaque to the roentgen ray and since the course of deposition runs practically parallel, recognition may at times prove difficult. This is particularly true in children with recently healed rickets where calcium had been laid down rapidly in the growing areas. Although in most cases of plumbism the dense zone is heavier than that seen in any other condition, still the milder case may not be so easy to differentiate.

Pirie[4] has recently called attention to a band of increased density at the ends of the long bones in the early stages of the condition called "marble bones." However this is a rare disease and should seldom cause confusion, particularly if considered with the history and clinical evidence.

The line in scurvy is narrower than that in lead poisoning and with the other characteristic changes it is easy to dis-

tinguish between these two conditions.[2] Notwithstanding possible errors in the roentgen interpretation it seems that we have here one of the most valuable and constant signs of lead poisoning in children.*

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* The writer wishes to thank Dr. Aub for the careful chemical studies of the case reported in this paper.

THE ROENTGENOLOGIC DIAGNOSIS OF PAPILLOMA OF THE DUODENUM

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PAPILLOMA of the duodenum is a very rare condition, and in the majority of reported cases of nonmalignant tumors of the duodenum, in which the roentgen ray has been employed as a diagnostic aid, no characteristic roentgen signs have been noted. For these reasons it seems important that this case should be recorded, as the preoperative diagnosis was made both roentgenologically and clinically, and was confirmed by operative findings and microscopic examination.

Golden, in 1928, reviewed the literature on nonmalignant tumors of the duodenum very thoroughly, and reported 2 new cases from his own clinic which were studied roentgenologically. In one a preoperative diagnosis of polyp was made by the roentgen ray and proved to be an adenoma, while the other case showed a filling defect in the duodenal bulb and proved to be a papilloma. Camp, in 1924, reported a case of myoma of the duodenum which was diagnosed as a benign tumor roentgenologically. Carman, in 1921, reported a sessile hemangioma of the first portion of the duodenum which he thought was a polyp on roentgenoscopic examination.

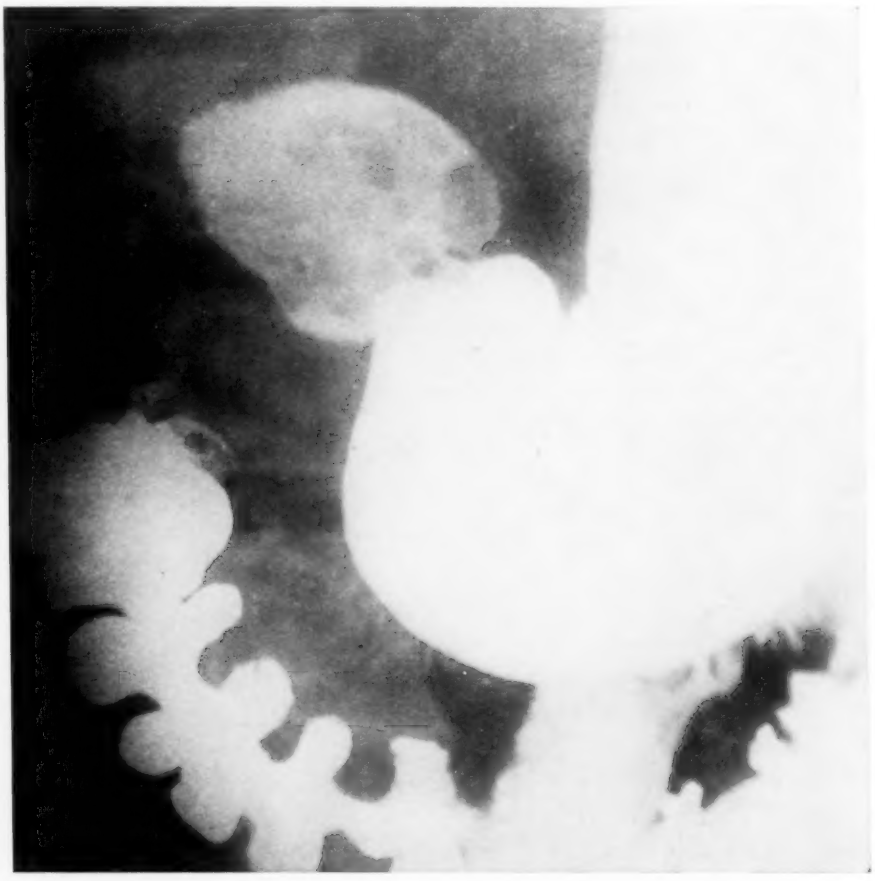

FIG. 1. Roentgenogram showing the multilocular type filling defect with the duodenal bulb filled.

Balfour and Henderson, in 1929, made a further review of the literature on benign tumors of the duodenum and added 4 cases. The usual roentgen diagnosis was duodenal ulcer. The preoperative roentgen diagnosis of papilloma was not made in any of these four cases. The findings were all adenomata one of the polypoid type. Bookman, in 1930, reported one case of papilloma of the duodenum in which the roentgen examination was reported as essentially negative. However, attention was called to the fact that the pylorus was somewhat distorted. In this case an ulcer of the duodenum was found fourteen months previously at operation. It is interesting to note that in the reported benign tumors of the duodenum only four have been diagnosed roentgenologically: the case of Camp's, the one of Carman's, one of Golden's two cases and the author's.

CASE REPORT

T. S. male, aged sixty-eight, was referred by Dr. Thomas R. Brown, Nov. 21, 1929, for gastrointestinal examination. There was a history of epigastric discomfort occurring over a period of six months. This was most pronounced in the morning and was sometimes relieved by alkalies or food. For two months prior to examination the discomfort had become almost constant, relief being obtained on the ingestion of a reduced amount of food. Except for a palpable liver edge two finger breadths below the costal margin, the physical examination was negative. The test meal showed achlorhydria—free acid O, total acidity 8. One specimen of stool revealed occult blood.

The roentgen report in part is as follows: "He has one of the most interesting findings I have ever seen. The pylorus seems to be all right, but as the barium goes through the duodenum it spreads out in a fan-shaped manner as though it were encircling a mass. The

Fig. 2. Roentgenogram showing clear-cut marginal outlines of the empty duodenal bulb. Note that the multilocular appearance of the bulb is still maintained.

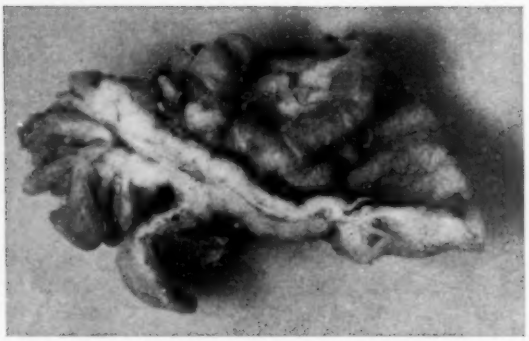

Fig. 3. Photograph of duodenal papilloma after removal.

marginal contours of the duodenal cap seem to be perfectly normal. We made a series of films which shows a definitely enlarged duodenal cap with a smooth contour and a very multilocular type filling defect which seems to be inside the cap. Impression: There is no doubt that there is a lesion, but the etiological factors are certainly very confusing from the roentgenologic point of view. It would seem almost certain that a neoplasm should be considered. This type of filling defect would warrant a diagnosis of papilloma or polyposis."

In studying Figures 1 and 2, it can be seen that the filling defect in the duodenum is a very unusual one and that a diagnosis such as papilloma, from these films, is not such a hazardous guess. However, in neither the roentgenoscopic examination by Dr. Brown or myself, nor in a considerable number of films was this visualized with any such clearness as shown in Figures 1 and 2. This fact is mentioned in order to show the necessity of making films of fine detail in any gastrointestinal examination in addition to the roentgenoscopic examination.

At operation by Dr. J. M. T. Finney on Nov. 25, 1929, an olive-sized mass was discovered in the first part of the duodenum. Incision of the anterior duodenal wall disclosed a lobulated papillomatous tumor on a broad base. A resection was performed. The patient, unfortunately, died of generalized peritonitis four days later.

Pathological Report. Dr. W. G. MacCallum, in brief.

Gross Description. "The specimen consists of the pylorus of the stomach and the first part of the duodenum which contains a polypoid growth extending into the lumen. There is a fold of tissue where the pylorus is usually seen and below this point there is duodenum. However, at another point in the circumference, at the same level, the mucosa of the stomach is seen to extend downward and up on to the polyp so that it would appear that the polyp is really derived from the stomach and has been dragged down to lie in the lumen of the first part of the duodenum. This may, however, not be borne out histologically.

"The polyp itself forms a mass measuring 4.5 cm. from base to tip and 5 cm. in diameter in its outer portion. There are, however, other masses of the same tissue which grow out from the base of the polyp in a more sessile manner and completely encircle the lumen just below the pylorus.

"On longitudinal section through the more pedunculated portion the stomach mucosa is seen to extend down over the polyp, measuring 1–2 mm. in thickness. Club-shaped processes project from the pedicle in all directions."

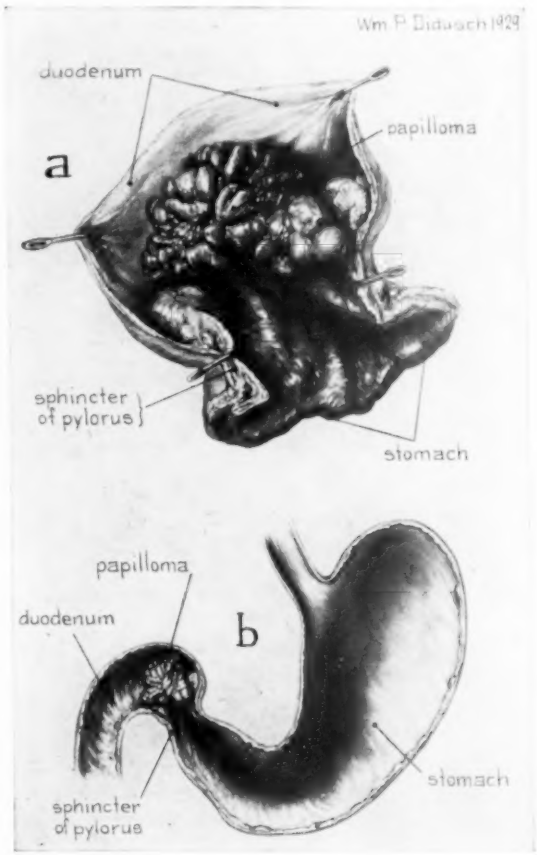

Fig. 4. Drawing showing the arrangement of the papilloma and its relation to the pylorus.

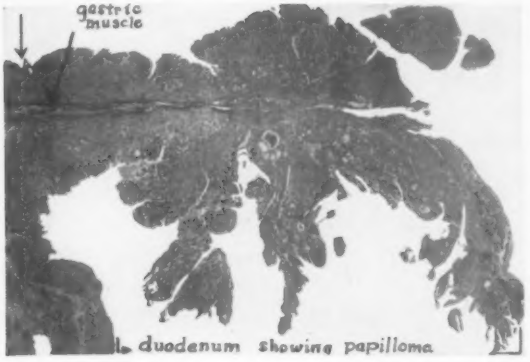

Fig. 5. Photomicrograph of a longitudinal section through the papilloma.

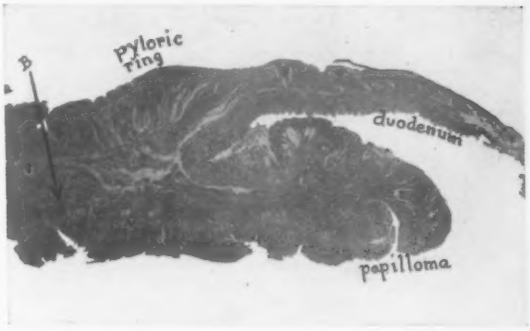

Fig. 6. Photomicrograph of the papilloma showing a tendency to malignant invasion of the gastric mucosa.

Figure 3 shows the gross specimen after removal. Figure 4 shows a drawing illustrating the arrangement of the papilloma in the duodenum and its relation to the pylorus.

Microscopic Description. "The sections taken longitudinally through this hanging, polypoid mass show gastric mucosa on the one side and duodenal mucosa on the other. Figure 5 is a photomicrograph of the longitudinal section through the pylorus and duodenum. The gastric mucosa at "A" clearly shows an extraordinary formation of ramifying, glandular downgrowths in patches scattered in the more normal mucosa. In the polyp the epithelial structures become very disorderly, remaining gland-like but very irregular in form. There are tubular glands in the stroma which are drawn up into the polyp, but one cannot be sure that they are not due to tangential cuts of a space between two folds.

"In Figure 6 the same structure is found except that in this section the polyp is more sessile. At the point marked "B" there are very definite downgrowths of epithelium into the submucosa of the stomach. They look like tubules of epithelium lying in lymph channels and there is a small lymphoid mass in which epithelial cells are lodged. Here they are in minute subdivision and distributed in small groups in the lymph node and in the form of very small tubules. I think this is a definite indication of a tendency to malignant invasion. No tumor has been found deeper than the submucosa, but there the invasion of lymphatics is extensive."

CONCLUSION

In suitable subjects, the roentgenoscopic examination should reveal a multilocular type filling defect which is suspicious enough to warrant making numerous films of the duodenal cap of sufficient clearness to justify a definite diagnosis of papilloma, while in adenoma a vacuolated type of filling defect should be definite enough to differentiate between these two types of benign tumor.

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ANEURYSM OF THE HORIZONTAL AORTIC ARCH*

WITH AUTOPSY

By GEORGE ROSENBAUM, M.D.

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THE usual definition of an aneurysm is a pulsating tumor, containing blood, and communicating with an artery or a cavity of the heart, the result of more or less limited dilatation of one or more of the arterial coats. Broadly considered, there are two types of aneurysm—fusiform and saccular. Either may exist alone or in a combined form; for instance, when a fusiform type shows a distinct sacculation, or a diverticulum-like pouch is seen in a saccular aneurysm. The horizontal arch is affected in over 80 per cent of all cases, the thoracic or abdominal sections of the aorta being but rarely involved.

According to Hampton and Jones of the Massachusetts General Hospital, the arteriosclerotic arch measures 5.6 cm., while a measurement of 7.8 cm. or over signifies an aneurysm. Luetic aortitis, before the aorta has become dilated or the aortic valve diseased, is frequently not demonstrable, and may result fatally by occlusion of the coronary arteries.

In fully 50 per cent of all cases, even the most expert clinician cannot elicit characteristic objective or subjective signs. This applies especially to the descending arch, which due to its deep position is often not diagnosed, even when of very large size. Also to the experienced roentgenologist, there are frequent occasions when the differential diagnosis of aneurysm from the numerous processes which closely resemble it are practically impossible. The difficulty lies in the fact that the mediastinum is the site of many puzzling masses which simulate aneurysm and the pulmonary and pleural complications that may obscure it.

In the differential diagnosis, the following must be considered: mediastinal tumors, especially sarcoma and lymphosarcoma; the enlargements seen in Hodgkin's disease and leucemia; dermoid cyst; substernal thyroid; tumors of the lung roots; esophageal diverticula, dilatations or carcinoma, and vertebral caries or tumors.

The symptoms of aneurysm result from pressure or erosion, either of osseous or soft structures or both. Probably the most frequent symptom of pressure is that upon the trachea. This may occur ventrodorsally upon the vertebrae or laterally, and is usually seen upon the roentgenogram, or under the roentgenoscope, especially in the oblique diameter of the thorax. Dysphagia is occasionally the first symptom. Pressure upon the larger bronchi is often present, and while this may not be seen directly, its secondary effects are visible in the form of bronchostenosis, bronchiectasis or pulmonary abscess. In fact, the pulmonary changes are often so marked that they have been aptly designated aneurysmal phthisis.

Usually the first question asked the roentgenologist about a patient with a chest mass is regarding its pulsation. If it has systolic pulsation it must be an aneurysm; if none is seen, then it cannot be. This is a view very commonly held but like so many of the Hippocratic aphorisms, is untrue. Quite the contrary is likely to be the case. Pulsation is rather uncommon, especially after the mass has existed for an appreciable time. Aneurysms, even of the largest size, may not pulsate. The reason is obvious when one notes the enormous thickening of the aneurysmal wall due to repeated inflammation, or as in the case reported, the presence of laminated clots, completely filling the sac. Fusiform aneurysms pulsate more than the saccular type, but mediastinal tumors may pulsate to a greater degree than aneurysm. This is due to transmission from the adjacent aorta or to an inherent vascularity of the tumor itself.

* Read at the March, 1930, meeting of the Philadelphia Roentgen Ray Society.

CASE REPORT

The patient, male, white, aged twenty-eight, was admitted to the Mt. Sinai Hospital on Feb. 21, 1930, with cough, expectoration, loss of weight and extreme fatigue. These symptoms were of six months' duration. The expectoration had increased greatly during the past three months and had become purulent. Three weeks before admission, he developed fever, marked prostration, anorexia and profuse perspiration. He was somewhat hoarse.

The patient had scarlet fever in childhood and a chancre fourteen years ago when he was fourteen. He is married and has three children, all living and well. His wife has had no miscarriages.

Examination by Dr. A. I. Rubenstone revealed a poorly nourished man with flushed features and a constant cough. The left pupil was smaller than the right and irregular. Both, however, reacted equally to light and accommodation. The pharynx was markedly congested and the tonsils badly diseased. There was diminished expansion in the left chest, dullness from the spine of the scapula downward and absent respirations over this area. Bronchovesicular breathing and bronchial râles after coughing were present in the left upper lobe. The right lung was emphysematous. The heart was not enlarged. Blood pressure, 110/68. The eye grounds were negative. While the larynx was markedly congested there was no paralysis of or pressure upon the vocal cords. Temperature was 104° F.; pulse, normal. Urine showed a marked cloud of albumin but was otherwise normal. The blood showed a mild anemia, with moderate leucocytosis—11,500, with 75 per cent polymorphonuclears. Blood chemistry was negative; Wassermann reaction strongly positive. Study of the sputum was negative for tubercle bacilli, spirilli, and parasites. Blood culture was negative. The electrocardiogram showed no abnormality.

Fig. 1.

Fig. 2.

The roentgen examination (Fig. 1) made on Feb. 22, the day after admission, showed a dilatation of the horizontal arch of the aorta, chiefly to the left, with a small heart slightly retracted to the left. Both diaphragms were normal. The aneurysmal phthisis of the lower left lobe was interpreted as infected atelectatic patches. The left chest was somewhat smaller than the right and the left diaphragm was slightly elevated, suggesting atelectasis. No pulsation was present in the aneurysm.

A few days after admission the patient developed a septic temperature and expectorated large quantities of pus. On the sixth day he was

suddenly awakened from sleep with severe pain in the left chest and shortness of breath, continuing for one-half hour. Temperature was 103° F. with pulse of 120 and rapid respirations.

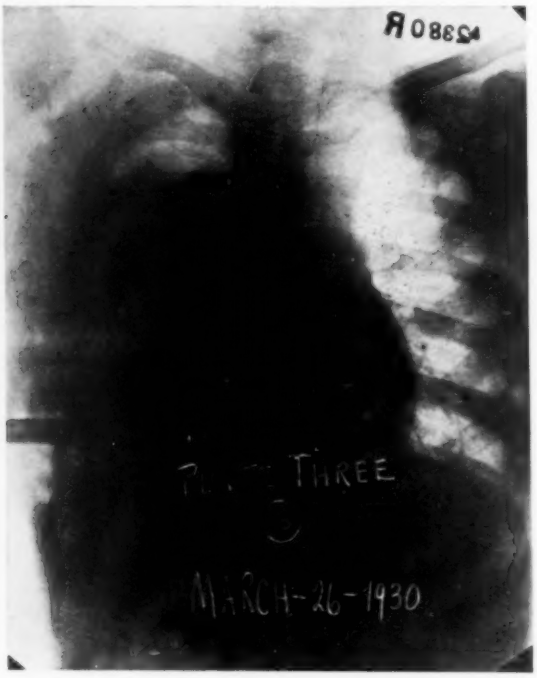

Fig. 3.

Clinically this was interpreted as a rupture of the lung abscess into the pleurae with empyema. Thoracentesis at this time removed 20 c.c. of a brownish pus which revealed hemolytic streptococci. The blood picture at this time showed a white count of 24,000, with 90 per cent polymorphonuclears. Roentgen study at this time (March 11) revealed a pleural effusion, atelectasis with some retraction of the heart to the left, and of added interest, the complete obliteration of the previously noted aneurysm (Fig. 2). Had this patient first been studied roentgenologically at this time, the diagnosis of aneurysm with lung abscess could not have been made under any circumstance.

Three days later (March 14) a thoracotomy was performed. Lung collapse was found and dense adhesions between the visceral and parietal pleura. A tube was inserted for drainage. However, even though drainage was free the patient still continued his septic fever. Transfusions were resorted to, but no improvement was noted. Four days later a resection of the seventh and eighth ribs was done. At this time the surgeon felt the lung abscess clearly. Roentgen study made on March 26 (Fig. 3) showed the drainage tube in situ. The heart had returned to its usual normal position, but the abscessed lung still showed densely cloudy and it was not possible to definitely see the aneurysm. In spite of frequent transfusions and stimulation, the patient died on March 28, five weeks after admission.

Autopsy by Dr. Davidson revealed a normal sized heart with a chronic fibrinous pericarditis and 270 c.c. of a thick, yellow, flocculent, purulent effusion. The first 5 cm. of the aorta showed numerous flat elevations measuring from 1 to 5 mm. in diameter, yellowish in color. The intima showed patches of ulceration. Five centimeters above the aortic ostium there was a fusiform dilatation involving the upper part of the ascending aorta and the horizontal arch. Within this fusiform aneurysm were two smaller saccular aneurysms. The one to the right was oval, 6×5 cm. and filled with a thrombus, which formed a complete cast of the aneurysm. The thrombus was organized and consisted of many distinct layers. After removal of this thrombus, it left an opening 3 cm. in diameter, abutting the trachea and left bronchus.

The second saccular aneurysm lay to the left. This was smaller and protruded into and was adherent to the apex of the left lung. The circumference of the aorta in the aneurysmal zone was 15 cm. The descending thoracic aorta measured 4.5 cm. in circumference and showed numerous flat yellow elevations. The trachea and left bronchus were congested and bulging due to pressure of the aneurysm.

In the left lung the pleural cavity was completely obliterated by dense adhesions. The upper lobe showed numerous small cavities. The lower lobe showed a cavity 8 cm. in diameter. The entire lung structure was atelectatic. The right lung was normal. The remaining viscera showed nothing of particular interest.

Cases of this kind are not rare, but it seems fitting occasionally to call specific attention to them. This was the case of a young man of twenty-eight, with syphilis of fourteen years' duration. He was married and the father of three healthy children. He developed a fusiform aneurysm of the

aortic arch, with two saccular aneurysms, none of which pulsated, because of dense thrombi. Erosion had occurred through the aorta which was prevented from perforating into the left bronchus and trachea by the laminated thrombus. Pressure on the left bronchus, however, caused small atelectatic patches which became infected, causing lung abscess, pleurisy and death.

Roentgenologists are aware of the fact, of which most clinicians are not, that under certain conditions, aneurysms do not pulsate and, with associated pulmonary or pleural complications, may not be demonstrable, even if of very large size. Had this case been first studied after March 11 (Fig. 2) no diagnosis could have been arrived at.

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EDITORIALS

THE EARLY DIAGNOSIS OF CARCINOMA OF THE STOMACH

CANCER of the stomach is the most common malignancy encountered. More than one-third of the cancers in men, and more than one-fifth in women occur in this organ. If this be true, then any method or combination of methods should be utilized in its early detection, and the most dependable diagnostic aid is the roentgen ray. With it the great majority of lesions of the stomach can be demonstrated, and it may be of tremendous importance in determining the operability of the lesion.

The classical roentgen sign of carcinoma of the stomach is a filling defect, and when the extraneous causes of filling defects such as pressure from the spleen or the transverse and splenic flexures of the colon are excluded, any persistent defect in the gastric outline must be regarded as malignant until proved otherwise.

In addition to the filling defect, one may observe changes in the size and position of the stomach, as well as alterations in the gastric peristalsis. The size of the stomach may be markedly reduced as compared with the normal. This is especially true of malignant lesions involving the midportion or cardiac end of the stomach. Rarely does carcinoma cause dilatation of the stomach unless it occurs at and early occludes the pyloric outlet. In such a case the stomach may be dilated considerably, though as a rule carcinomatous infiltration reduces the size of the stomach, and unless there is actual obstruction to the pyloric outlet the stomach empties its contents quite rapidly. This is an important differential point between a malignant and a benign lesion, since in ulcer cases the emptying time of the stomach is either normal or delayed. Not until the tumor has actually produced stenosis do we get obstructive symptoms in carcinoma. Then the gastric peristalsis may be exaggerated, both as regards its frequency and depth, and one may actually observe reverse peristalsis.

Fortunately for the patient as well as the roentgenologist, the majority of gastric carcinomata occur in the pyloric region, which makes their detection less difficult for the roentgenologist and their operative interference more favorable for the patient.

The cancers of the stomach which are missed in roentgen examinations, as a rule, are those occurring high up in the cardiac portion of the stomach, and unless particular care is taken in the examination of this region, a large-sized lesion may be easily overlooked, but carcinomata of the cardiac portion of the stomach represent a very small proportion of the total gastric lesions.

In spite of the clear-cut roentgenologic criteria laid down for the diagnosis of gastric carcinoma and the reasonable assurance one may have in stating positively the presence or absence of malignant disease of the stomach, there still remains much justification for the prevalent pessimism that obtains regarding the early diagnosis of gastric cancer, one important cause being the latent period of greater or lesser duration associated with this disease which makes an early diagnosis difficult.

Haudek,[1] in a recent excellent article, distinguishes four causes for delayed roentgen diagnosis. He groups these under: (1) the latent period; (2) delayed roentgen

[1] Haudek, Martin. X-rays in diagnosis of early carcinoma of the stomach. *Brit. J. Radiol.*, 1929, *2*, 421–433.

examination; (3) faulty roentgen examination, and (4) the incompleteness of our present roentgen technique.

The latent period, that is, the time during which the gastric carcinoma remains symptom-free, is the prime factor which must be reckoned with, and Haudek suggests that some form of serum reaction may be of assistance in the diagnosis of these cases. This period of varying duration depends on the type and situation of the tumor. In carcinoma of the body of the stomach, especially with diffusely infiltrating growth, the local symptoms often occur so late that however prompt the operation there is rarely any chance of being able to perform a radical operation. The symptoms which lead to the earliest recognition of growth are pyloric stenosis and hemorrhage.

The Delayed Roentgen Examination. The intrinsic nature of the growth itself is too often the primary cause of the delay in the diagnosis. The symptom-complex produced by it is of such an indefinite nature that the patient seeks medical advice late in the disease. Too often the fault lies in the false sense of security engendered in the mind of the physician by the presence of "chronic dyspepsia," a dangerous catch-phrase in the man or woman of carcinoma age. A recent analysis of 365 cases of cancer of the stomach made by Saltzstein and Sandwiess[1] illustrates the point in question. The first symptoms given in 300 cases were studied. The analysis of these cases revealed the fact that histories of patients with cancer of the stomach can easily be divided into those which indicate a previous indigestion of several years' duration of more or less severity and those in which the cancer started suddenly from apparently good health. Of 287 cases in which such data were obtained, 71, or 24.7 per cent started from long preceding indigestion. The remaining 216, or 75 per cent, started from previous good health. An analysis of these figures in comparison with others would indicate that a large series of cases of cancer of the stomach would show 15 per cent or more starting from long continued or preceding indigestion. It is in this group of cases where the roentgenologist may by more careful examinations increase the percentage of accurate diagnosis, provided the patient is referred early for examination and provided the technique of his examination is sufficiently thorough. In the group of cases analyzed, namely, 75.3 per cent which started suddenly from previous good health, 69 per cent started with symptoms which, though mild, were distinctly referable to a pathologic disturbance in the upper part of the abdomen and in these cases it was also discovered that cancers which start with atypical symptoms are more apt to be in the left half of the stomach. This is a point which the roentgenologist should distinctly keep in mind, namely, that a patient with vague indefinite symptoms referable to the upper abdomen in the carcinoma age may have a lesion in the left half of the stomach and his examination should be made with that point of view in mind.

In this group of cases the average duration of symptoms was 8.1 months. In a series of cases reported by McVicar and Daly[1] the average duration of symptoms in the group of resectable carcinomas was 10.9 months, closely paralleling the above group of cases

The hope, then, for improvement in the treatment of gastric carcinoma lies in the realization of the necessity of early roentgen examinations of all persons with gastric complaint.

But not too infrequently the examination is *faulty or inadequate*, as Haudek points out. He calls attention to the fact that if the results of roentgen examinations are often unsatisfactory and if, in consequence, roentgen investigation of the stomach does not yet enjoy the general confidence which

[1] Saltzstein, H. C., and Sandweiss, D. J. The problem of cancer of the stomach. *Arch. Surg.*, 1930, *21*, 113–127.

[1] McVicar, C. S., and Daly, Joseph. Diagnosis of operable cancer of the stomach. *Ann. Int. Med.*, 1927–1928, *1*, 152.

should be reposed in it, then possible sources of error must be referred to.

"To begin with, the difficulty of X-ray examination of the stomach is generally underestimated. In this very matter of X-ray investigation, the laity, and unfortunately a good many doctors as well, believe that an X-ray *apparatus* is the chief requisite for the production of a correct diagnosis. A man will sometimes commence independent practice, after a short apprenticeship principally devoted to learning the technique of the apparatus, who entirely lacks the rudiments of the knowledge necessary for the responsible work of a radiologist. *We must make it clear to all concerned, that the results of examination depend far more on the quality of the worker than on the quality of the apparatus.* He must, if he is a radiological specialist, have a good preliminary knowledge of pathology and internal medicine, and in the same way, an internist or surgeon who chooses to make independent X-ray examination in his consulting practice must be armed with a thorough knowledge of general radiology. He should never hesitate to call in a radiologist of special experience in cases where he feels uncertain of his own interpretation. I find that such consultations are far too rarely asked for; this is a serious misfortune for the patient.

"To attempt radiological diagnosis of stomach and duodenal conditions without being also able to make use of photographic procedure—means that the method is an incomplete one. However much the screening accomplishes, yet its completion by photography—that is by technically good radiograms, skilfully taken so as to fix or first bring to light the significant signs—is a procedure which must never be omitted. Diagnosis of commencing carcinoma, closely bound up as it is with a study of the mucosal relief pattern, is, apart from radiograms, impossible. But even experienced radiologists must needs run the risk of making mistakes if too many examinations are required of them, and if they undertake them."

In his discussion of the *method and technique* of the roentgen examination in the early diagnosis of carcinoma of the stomach, Haudek calls attention to the fact that the examination should include a case history, inspection and palpation. If the roentgenologist has had considerable experience in taking case histories and is well trained clinically this will often enable him to pick out suspicious cases of carcinoma which require special form of investigation, and not infrequently it will give him distinct leads which may enable him to make a correct diagnosis, though the patient may have been referred with a totally different diagnosis. This is particularly true in lesions of the large bowel. The roentgen examination of course always includes an examination of the chest, and the passage of the first mouthful of the barium suspension through the esophagus is followed so as to make sure that there is no lesion in this portion of the gastrointestinal tract. If a suspicious area is encountered or if the patient complains of the slightest difficulty in swallowing the barium, Haudek suggests the use of a gelatine capsule filled with one gram of barium. Many others have suggested the use of gelatine bougies cut to varying sizes and shapes, and still others have suggested the use of small bits of cracker mixed with barium so that the slow passage of these through the esophagus might be easily detected under the roentgenoscopic screen. As stated above, early lesions about the cardiac orifice are the type that are usually missed, and if the roentgenologist will be careful to vary his examination as suggested by Haudek and others, undoubtedly lesions will be observed which otherwise might escape detection.

Haudek calls attention also to his detailed examination of the stomach, which he divides into two principal parts: first, examination of the contracted stomach and its folds, and second, the examination of the more fully distended stomach. For this purpose the patient while standing

drinks at first only about 30 c.c. of a thick barium emulsion which as it trickles down is spread over the gastric wall by gentle pressure. This is a method also used to great advantage by Berg[1] and his coworkers. By this method "every detail from air cap to the pyloric part is carefully observed, and attention is paid to such points as a collection of secretion below the air cap, a tumour shadow projecting into the air cap, and the course, width and regularity of the mucosal folds. By turning the patient, the anterior and posterior walls of the stomach are thoroughly examined. Small ulcer niches, barium rests in tumour craters, and filling defects in any possible situation are most likely to be found at this stage. Radiograms in selected positions, usually with a small diaphragm, are taken to fix the exact appearance and allow them to be studied in detail later." This detailed examination of the stomach is too often neglected and if followed more generally would, we believe, lead to the detection of lesions of smaller size than is possible by the more generally followed method where the patient drinks immediately a large glass of barium mixture.

In the second part of the examination, after a detailed study with the small drink of thick barium mixture, the stomach is completely filled with an additional barium mixture and with the patient standing and being turned from side to side, the regularity of the contours as well as the flexibility of the walls and the gastric peristalsis are noted. If there is the slightest suspicion of carcinoma or other gastric defects, examination in the prone position is made which brings into relief the lesser curvature of the stomach more clearly. Suspicious regions are palpated for evidence of abdominal resistance while the patient is standing. Films are taken during the roentgenoscopic examination to record suspicious areas. Any number of films may be taken, but Haudek in his routine examinations recommends the taking of at least five: "That is, after the first mouthful one film in the standing, prone and supine position, after complete filling one film in standing and prone position."

It can readily be seen that if a detailed study of the gastric mucosa such as is suggested by Haudek, Berg and others, is carried out in the examination of the gastrointestinal tract, the general level of accuracy in the roentgen diagnosis of carcinoma of the stomach both in its early and late manifestations will be greatly improved. Too often the examination is carried out without a proper knowledge of the exact site of the lesions which are so frequently missed in roentgen examinations, namely, the region about the cardiac orifice and in the fundus of the stomach on its posterior wall. It may be argued that these lesions are not amenable to surgical treatment so that their early recognition by the roentgen ray is not of great importance so far as the ultimate outcome of the case is concerned. However it is well within the bounds of the possible that a surgical technique will be developed which will permit these lesions to be handled surgically and the inadequacy of the present surgical procedure should not in any way obviate the roentgenologist's responsibility in making as early a diagnosis as is possible. While the pessimism shared by many as regards the early diagnosis of carcinoma of the stomach may have a certain justification, the roentgenologist may find considerable encouragement in Haudek's conclusions:

"We may fairly hope, we may reasonably expect, that it will fall to our lot to attain in the future yet greater success in the diagnosis of the smallest tumours and of malignant changes in the mucosa over and above the results hitherto reached—results which are even now by no means to be despised. One thing is certain—that none but men equipped with a sound knowledge of pathology, clinical medicine, and radiology can ever help cancer sufferers to the earliest possible diagnosis and cure of their disease."

[1] Berg, H. H. Röntgenuntersuchungen am Innenrelief des Verdauungskanals. Georg Thieme, Leipzig, 1930.

William B. Bowman
1885–1930

WILLIAM B. BOWMAN, M.D.

1885-1930

THE many friends of Dr. Bowman will be grieved to learn of his sudden death which occurred in Los Angeles on October 20, 1930. He arrived home from his eastern trip where he attended the meeting of the American Roentgen Ray Society at West Baden, on Sunday morning, October 19. That afternoon he went to his office where he took care of his accumulated correspondence and other matters. About six o'clock he complained of feeling tired and went home. The following morning no one heard from him and an investigation found him dead in bed. The cause of his death was myocarditis and coronary thrombosis.

Dr. Bowman was born on November 6, 1885, and graduated from St. Louis University School of Medicine in 1910. Shortly afterward he went to Los Angeles where he served as interne at St. Vincent's Hospital. About 1912 he became interested in roentgenology and very shortly afterwards devoted his entire time to it. He made many contributions to the study of roentgenology; probably his most well-known contributions were his interesting studies on coccidioidal granuloma. He served with distinction during the World War, being retired with the rank of Major. He was a member of many social clubs and organizations in Los Angeles and had innumerable friends both in and out of the profession. Bill, as he was familiarly known by those who knew him, was a rugged character, with, however, a very soft kindly side, and at the annual meetings of the American Roentgen Ray Society he was always the center of an admiring group of friends where his cheerfulness and keen repartee will be sadly missed at subsequent meetings. He was never averse to entering a controversy, provided it was a clean one, never holding any grudges against an honest opponent. He was at times difficult to influence but once he gave his hearty support to a proposition he was "there for good." He could always be depended upon to support anything pertaining to the furtherance of the ideals of his profession. An exemplification of this was never better given than when he led the State Society fight in California some years ago at a time when it looked as though the practice of roentgenology would be officially turned over to technicians. Many of us participated in this controversy which undoubtedly would have been lost if it had not been for Bill's dogged persistence in holding out for no compromise, as a result of which there was a complete backing down of the opposition. All of us will be forever indebted to him for his part in this controversy.

His place in the community will be hard to fill and his place in the hearts of those who knew him well will never be filled, and in his death roentgenology has lost a keen observer and a splendid counselor.

R. G. Taylor

WILLIAM B. BOWMAN

AN APPRECIATION

THE chronology of the events of Bill Bowman's short life can be recorded but the cheerfulness and the charms of this knight-errant of Western Coast Roentgenology is the theme of my eulogy.

Not long ago he related why he determined to go into medicine and eventually roentgenology. It seems that he was working or rather slaving in a railroad office and felt that the future was going to be rather a routine piece of drudgery; so he decided to look into the professions. He decided that

a diminutive stature was not a handicap in medicine and proceeded to make inquiries. His first interview was with a physician who dilated upon the difficulties and the demand for brain work in attaining the education necessary and he rather doubted Bill's ability to complete the medical course. Such admonitions were enough to raise the combativeness or ambitions of Bill and he proceeded at once to matriculate in medicine. He completed this job well and in the process was impressed and interested by his instructor in roentgenology at St. Louis University, Russell D. Carman. He decided to become a roentgenologist and go West.

He settled in Los Angeles and proceeded to make his place in the city and in his state and along the coast before he ventured to the American Roentgen Ray Society meeting at Boston in 1913. Since that time he has been an intimate part of the science and fellowship of American Roentgenology. This friendliness and comradeship was such a big part of his small body that everyone was always surprised when the science of the man displayed itself.

Bill played hard and worked hard. He penalized himself for every indulgence. He constantly set for himself goals far ahead and he reached these goals only to place the markers farther ahead. Whatever the deflections of life, pleasure and friends, Bill stuck to his task at the expense of his small body and has now paid the supreme penalty. His was an Achilles type of life. Life was not an existence to Bill; it was a grand adventure that he intended to explore in every and all directions. All who knew him are ready to acknowledge that Bill had about completed the job of life before his heart took the disastrous rôle of the Achilles tendon of that ancient hero of Greece.

Any eulogy of Bill Bowman must narrate his abilities as a scientist; his patriotic devotion as a soldier, and a consummate friendliness with all manner of men.

As a scientific physician he displayed originality and astute observation of clinical and roentgen phenomena. Witness his original work upon coccidioidal granuloma as displayed in bone and his observations upon spondylolisthetic spines.

As a soldier he took a most active part in the World War as Commandant of the Los Angeles School of Military Roentgenology, and later conducted the x-ray school of the A. E. F. at advanced medical headquarters. All of these activities were sacrifices to his patriotism.

The friendliness, the cheerfulness, the kindliness of this knight-errant will be fine memories to his host of acquaintances throughout the world. He possessed a fine spirit, a glorious tolerance and a smiling mind.

Thus passeth a gallant knight-errant! Salute!

E. H. Skinner

RICHARD MARK BROWN, M.D.

1884-1930

DR. RICHARD MARK BROWN of Ogden, Utah, died September 12, 1930 in Holy Cross Hospital, Salt Lake City, Utah, following an operation on September 8.

Dr. Brown was born in Ogden, Utah, on April 17, 1884, the son of Mr. and Mrs. Richard T. Brown. He was the grandson of Dr. Jesse James Murphy, a pioneer Utah physician, who came to Utah in 1869 from Georgia. Dr. Brown originally planned to follow the engineering profession, having studied engineering at the Utah State Agricultural College, Logan, Utah, for three years, prior to beginning the study of medicine. Dr. Brown took his medical training at the University of Utah and Columbia University, graduating from the latter in 1912. He interned in the New York Post Graduate Hospital, later return-

ing to Ogden where he engaged in a general medical and surgical practice until the World War, when he volunteered for service in the Medical Corps. During this service he became interested in roentgenology, and after discharge went to the New York Post Graduate Medical School for special training in this field. On completion of the course he opened an office in Ogden, limiting his practice to roentgenology. He later also opened an office in Salt Lake City, Utah. For several years he was roentgenologist to the Dee Memorial Hospital at Ogden.

Dr. Brown was married in 1917 to Miss Mary Wattis, who survives him. He is also survived by his mother, a sister, and four children.

Dr. Brown was a member of the Weber County Medical Society, Utah State Medical Association, American Roentgen Ray Society and the Radiological Society of North America. He was for several years counselor for the state of Utah in the last named Society.

James P. Kerby

As we go to press, we learn with great regret of the death of Dr. Preston M. Hickey, Porfessor of Roentgenology, University of Michigan, Ann Arbor, Michigan. An account of Dr. Hickey's life and work will appear in an early issue of the Journal.

SOCIETY PROCEEDINGS, CORRESPONDENCE AND NEWS ITEMS

Items for this section solicited promptly after the events to which they refer.

MEETINGS OF ROENTGEN SOCIETIES*

UNITED STATES OF AMERICA

AMERICAN ROENTGEN RAY SOCIETY
Secretary, Dr. John T. Murphy, 421 Michigan St., Toledo, Ohio.
Thirty-second Annual Meeting: Atlantic City, N. J., 1931.

AMERICAN COLLEGE OF RADIOLOGY
Secretary, Dr. Albert Soiland, 1407 S. Hope St., Los Angeles, Calif.
Annual Meeting: Philadelphia, 1931.

SECTION ON RADIOLOGY, AMERICAN MEDICAL ASSOCIATION
Secretary, Dr. G. W. Grier, Jenkins Arcade, Pittsburgh, Pa.
Annual meeting: Philadelphia, 1931.

RADIOLOGICAL SOCIETY OF NORTH AMERICA
Secretary, Dr. I. S. Trostler, 812 Marshall Field Annex, Chicago, Ill.
Sixteenth annual session: Los Angeles, Calif., Dec. 1–5, 1930.

RADIOLOGICAL SECTION, LOS ANGELES COUNTY MEDICAL SOCIETY
Secretary, Dr. Orville N. Meland, 1407 S. Hope St., Los Angeles.
Meets on the third Wednesday of each month at the California Hospital.

RADIOLOGICAL SECTION, SOUTHERN MEDICAL ASSOCIATION
Secretary, Dr. W. S. Lawrence, Medical Arts Bldg., Memphis, Tenn.

BUFFALO RADIOLOGICAL SOCIETY
Secretary-Treasurer, Dr. Joseph S. Gian-Franceschi, 610 Niagara St.
Meets second Monday of each month except during the summer months, the place of meeting to be selected by the host.

CHICAGO ROENTGEN SOCIETY
Secretary, Dr. George M. Landau, 660 Groveland Park.
Meeting second Thursday of each month October to May inclusive at Virginia Hotel.

CLEVELAND RADIOLOGICAL SOCIETY
Secretary, Dr. A. Strauss, 518 Medical Arts Bldg.
Meetings are held at 6:15 P.M., at the Cleveland Chamber of Commerce Club rooms on the fourth Monday of each month from October to April, inclusive.

DETROIT ROENTGEN RAY AND RADIUM SOCIETY
Secretary, Dr. O. J. Shore, Fisher Building.
Meets monthly on first Thursday from October to May, at Wayne County Medical Society Building.

CENTRAL ILLINOIS RADIOLOGICAL SOCIETY
Secretary, Dr. H. C. Kariher, Decatur, Illinois.
Regular meetings held quarterly.

INDIANA ROENTGEN SOCIETY
Secretary, Dr. J. N. Collins, Indianapolis, Ind.
Annual meeting each February 22 in Indianapolis.

MILWAUKEE ROENTGEN RAY SOCIETY
Secretary, Dr. J. E. Habbe, 221 Wisconsin Ave., Milwaukee.
Meets first Friday in October, December, February and April.
Place of meeting designated by the president.

MINNESOTA RADIOLOGICAL SOCIETY
Secretary, Dr. L. G. Rigler, University Hospital, Minneapolis, Minn.
Next meeting, to be announced.

NEW ENGLAND ROENTGEN RAY SOCIETY
Secretary, Dr. Thomas R. Healy, 370 Marlboro St., Boston, Mass.
Meets monthly on third Friday, Boston Medical Library.

NEW YORK ROENTGEN SOCIETY
Secretary, Dr. J. Bennett Edwards, Englewood Hospital, Englewood, N. J.
Meets monthly on third Monday, New York Academy of Medicine, at 8:30 P.M.

CENTRAL NEW YORK ROENTGEN RAY SOCIETY
Secretary, Dr. D. S. Childs, 316 Gurney Bldg., Syracuse, N. Y. Three meetings a year—April, August and November.

PACIFIC COAST ROENTGEN RAY SOCIETY
Secretary, Dr. Harold B. Thompson, Seattle, Wash.
Two meetings a year.

PENNSYLVANIA RADIOLOGICAL SOCIETY
Secretary, Dr. W. E. Reiley, Clearfield, Penna.
Two meetings a year, April and October.

PHILADELPHIA ROENTGEN RAY SOCIETY
Secretary, Dr. Karl Kornblum, 3400 Spruce St.
Meeting first Thursday of each month from October to May inclusive, at 8:15 P.M., in Thomson Hall, College of Physicians, 19 S. 22d St.

* Secretaries of societies not here listed are requested to send the necessary information to the Editor.

ROCHESTER ROENTGEN RAY SOCIETY, ROCHESTER, N. Y.
Secretary, Dr. Camp C. Thomas, 476 Lake Ave.
Meets monthly on the first Friday evening at 7:45 at the Rochester Medical Association Building.

ST. LOUIS ROENTGEN CLUB
Secretary-Treasurer, Dr. L. R. Sante, Missouri Building.
Meets first week of each month. Time and place of meetings designated by president.

TEXAS RADIOLOGICAL SOCIETY
Secretary-Treasurer, Dr. C. P. Harris, Houston, Texas.
Meets annually one day preceding the meeting of the Texas State Medical Association.

UNIVERSITY OF MIGHIGAN ROENTGEN RAY SOCIETY
Secretary, Dr. D. M. Clark, University Hospital, Ann Arbor, Mich.
Meets every Wednesday evening from September to July, at 7:30 o'clock in the amphitheatre of the University Hospital.

VIRGINIA ROENTGEN RAY CLUB
Secretary, Dr. Wright Clarkson, 205 S. Sycamore St., Petersburg, Va.
Next meeting, to be announced.

Cuba

SOCIEDAD CUBANA DE RADIOLOGIA Y FISIOTERAPIA
Secretary, Dr. Francisco Padron, Enrique Villuendas 64, Havana, Cuba. Meets monthly in Havana.

British Empire

BRITISH INSTITUTE OF RADIOLOGY INCORPORATED WITH THE RÖNTGEN SOCIETY
Meets on the third Thursday of each month, from November to June inclusive, at 8:15 P.M., at 32 Welbeck St., London, W. 1., or as advertised.

ELECTRO-THERAPEUTIC SECTION OF THE ROYAL SOCIETY OF MEDICINE (CONFINED TO MEDICAL MEMBERS)
Meets on the third Friday of each month during the winter at 8:30 P.M. at the Royal Society of Medicine, 1 Wimpole St., London, W. 1.

SECTION OF RADIOLOGY AND MEDICAL ELECTRICITY, AUSTRALASIAN MEDICAL CONGRESS
Secretary, Dr. H. M. Cutler, 139 Macquarie St., Sydney, New South Wales.

RADIOLOGICAL SECTION OF THE VICTORIAN BRANCH OF THE BRITISH MEDICAL ASSOCIATION
Secretary, Dr. Colin Macdonald, Lister House, 61 Collins St., Melbourne, Australia.
Meets monthly at Melbourne during the winter.

SECTION ON RADIOLOGY, CANADIAN MEDICAL ASSOCIATION
Secretary, Dr. A. H. Rolph, 160 St. George St., Toronto, Ont.

RADIOLOGICAL SECTION, NEW ZEALAND BRITISH MEDICAL ASSOCIATION
Secretary, Dr. P. C. Fenwick, The Hospital, Christ-church.
Meets annually.

Continental Europe

BELGIAN SOCIETY OF ROENTGENOLOGY
Secretary, Dr. J. Boine, Avenue des Alliés, 134, Louvain (Belgium).
Meets monthly on second Sunday at d'Egmonds Palace, Brussels, except in the summertime.

SOCIETE DE RADIOLOGIE MÉDICALE DE FRANCE
Meets monthly on second Tuesday, except during months of August and September, 12 Rue de Seine, Paris.

SOCIÉTÉ SUISSE DE RADIOLOGIE (SCHWEIZERISCHE RÖNTGEN-GESELLSCHAFT)
Secretary for French language, Dr. A. Grosjean, La Chaux de Fonds.
Secretary for German language, Dr. Scheurer, Molzgasse, Biel.
Meets annually in different cities.

SOCIÉTÉ FRANCAISE D'ELECTROTHÉRAPIE ET DE RADIOLOGIE MÉDICALE
Meets monthly on fourth Tuesday, except during months of August and September, 12 Rue de Seine, Paris.

ASSOCIATION OF GERMAN ROENTGENOLOGISTS AND RADIOLOGISTS IN CZECH-O-SLOVAKIA
Secretary, Dr. Walter Altschul, German University, Prague, 11/52.

DEUTSCHE RÖNTGEN-GESELLSCHAFT (GESELLSCHAFT FÜR RÖNTGENKUNDE UND STRAHLENFORSCHUNG)
Meets annually in April, alternating one year in Berlin, one year in some other German city. Meets in addition every two years with the Gesellschaft deutscher Naturforscher und Aerzte.
Permanent secretary, Professor Dr. Haenisch, Klopstockstrasse 10, Hamburg, Germany.

SÜD- UND WESTDEUTSCHE RÖNTGENGESELLSCHAFT
Meets annually in different cities.

NORD- UND OSTDEUTSCHE RÖENTGENGESELLSCHAFT
Meets annually in different cities.

DUTCH SOCIETY OF ELECTROLOGY AND ROENTGENOLOGY
Holds two meetings a year in Amsterdam, one in the Spring, and one in the Fall.

SOCIETA ITALIANA RADIOLOGIA MEDICA
Secretary, Professor M. Ponzio, University of Turin, Turin.

SOCIETATEA ROMANA DE RADIOLOGIE SI ELECTROLOGIE
Secretary, Dr. Nicolae Busila, 44 Elizabeta Blvd., Bucarest.
Meets second Monday in every month with the exception of July and August.

ALL-RUSSIAN ROENTGEN RAY ASSOCIATION, LENINGRAD, USSR in the State Institute of Roentgenology and Radiology, 6 Roentgen St.
Secretaries, Drs. S. A. Reinberg and S. G. Simonson.
Meets annually.

LENINGRAD ROENTGEN RAY SOCIETY
Secretaries, Drs. S. G. Simonson and G. A. Gusterin.
Meets monthly on the first Monday at 8 o'clock in the State Institute of Roentgenology and Radiology, Leningrad.

MOSCOW ROENTGEN RAY SOCIETY
Secretaries, Drs. L. L. Holst, A. W. Ssamygin and S. T. Konobejevsky.
Meets monthly on the first Monday at 8 o'clock, the place of meeting being selected by the Society.

POLISH SOCIETY OF RADIOLOGY
Secretary, Dr. A. Elektorowicz, 19 Hoza St., Warsaw. Meets annually.

WARSAW SECTION, POLISH SOCIETY OF RADIOLOGY
Secretary, Dr. B. Krynski, 11 Zielna St.
Meets once a month except in the summertime.

SCANDINAVIAN ROENTGEN SOCIETIES
The Scandinavian roentgen societies have formed a joint association called the Northern Association for Medical Radiology, meeting every second year in the different countries belonging to the Association. Each of the following societies, with the exception of the Denmark Society, meets every second month except in the summertime:

SOCIETY OF MEDICAL RADIOLOGY OF SWEDEN
Meets in Stockholm.

SOCIETY OF MEDICAL RADIOLOGY IN NORWAY
Meets in Oslo.

SOCIETY OF MEDICAL RADIOLOGY IN DENMARK
Secretary, Dr. O. Wissing, Copenhagen.
Meets on the second Wednesday of each month from October to July in Copenhagen, at 8 o'clock in the State Institute of Roentgenology.

SOCIETY OF MEDICAL RADIOLOGY IN FINLAND
Meets in Helsingfors.

VIENNA SOCIETY OF ROENTGENOLOGY
Secretary, Professor Holzknecht, Vienna, IX, General Hospital.
Meets on the first Tuesday of each month from October to July.

VIENNA LETTER

(From our Special Correspondent)

AN ELECTRICAL ACCIDENT

Dr. L. Gidro exhibited a patient at the medical society who, while being screened, touched a live wire conducting a current of 15,000 volts. Instantly following the accident the patient became unconscious and remained so for twenty-four hours. Directly under the mastoid process, where the current entered, was seen a zigzag line, one-fifth of an inch wide, extending down to the level of the manubrium. The epidermis was destroyed over the whole length of this area, which was covered by a parchment-like dried skin. On the outer surface of the right upper and lower limbs several sharply outlined necrotic patches about the size of a shilling were observed and similar patches were also seen on the tips of the toes and on the heel at the site of the exit of the current. The latter were typical electric current marks. These areas healed in three weeks leaving soft scars. Dr. Gidro pointed out the fact that this case shows that the injury and eventual death caused by electric currents depends not so much on the tension as on the intensity of the current passing through the body. Of course great individual fluctuations may be experienced. In general, however, we may assume that a current of one ampere can kill a man. Of all the organs of the human body, the greatest resistance against the current is offered by the skin, in comparison with which the resistance of the other tissues is quite negligible. Death in most of these cases is preceded by a trance and artificial respiration should be applied for hours even, because in individual instances the patient can be resuscitated in this way. It is very important that this fact should be taught to the laity as well as to medical men. Dr. Zempleni added that in cases of algid asphyxia of the new-born artificial respiration should be carried on as long as heart action continues. The lethal effect of the electric current depends not

only on the intensity but also on many other circumstances, namely, the duration of the action of the current, the conditions of insulation, etc., as all play an important part.

IMPROVEMENT OF THE ROENTGEN DEMONSTRATION OF THE GALL-BLADDER

Dr. Schemensky of Küstrin, Germany, states that by the administration of a very strong cholagogue (any efficacious cholagogue will do; he made his experiments with a very reliable, strong cholagogue called decholin) in conjunction with the gall-bladder dye he succeeded in securing a quicker pouring out of the dye stored in the liver, thereby hastening the visualization of the gall-bladder shadow. He gives the dye orally or intravenously, while the cholagogue itself he always gives intravenously. In the first experimental series, the gall-bladder dye was injected in the morning and one to two hours subsequently, when the dye had reached the liver, 10 c.c. of a 20 per cent cholagogue solution was given. Within three to four hours subsequent to the injection of the dye distinct shadows of the gall-bladder could be seen on the roentgenogram. This method marks distinct progress in the cholecystographic examination because it shortens the time of the examination, renders the exposure of several films superfluous and shortens the period during which the patients must go without food. He also mentioned the fact that the occasionally observed disagreeable after-effects of the intravenous administration of the dye were avoided through the injection of cholagogues. In the second series of experiments, the gall-bladder dye was given to the patients in the morning, according to the Sandström method, at varying intervals by mouth, and a short time afterwards the cholagogue was given intravenously. In spite of numerous experiments and innumerable roentgenograms it was impossible to ascertain any acceleration of the appearance of the gall-bladder shadow. Similar results were also reported by Rosenthal who likewise found that the administration of a cholagogue considerably shortens the period before the appearance of the gall-bladder shadow, but only in case the dye is given intravenously, while there is no difference if the dye is given by mouth.

ROENTGEN APPARATUS WHICH GIVES ABSOLUTE SAFETY AGAINST HIGH TENSION CURRENTS IN ROENTGEN INSTALLATIONS

In the Spring of this year, the German Ministry of Public Welfare enacted a law which prescribes the rules to be observed by all roentgen laboratories and electrotherapeutic institutes working with high tension currents. The observation of these rules will obviate electrical accidents. In characteristic fashion, German roentgen manufacturers immediately upon the enactment of this law, hastened to build sets conforming to these rules and regulations, although this meant a great sacrifice on their part because they had to transform all their sets in stock to conform to this regulation. Some of the manufacturers brought out rather ingenious devices of protection; for instance, one constructed a portable roentgen apparatus which is capable of supplying a current of 10 ma. and 63,000 volts, the whole apparatus from the switches to the tube forming a unit which may be touched anywhere without coming in contact with live wires. Another firm built a large deep therapy apparatus whose transformer, tubes and stand constitute one fully protected unit, lending absolute safety against high tension currents. In fact the apparatus was so constructed that it might be touched anywhere with impunity. The law includes a paragraph which gives instructions about what to do with old apparatus which is at present in use in order to bring it up to date as regards protective measures.

EXPERIMENTAL CONTRIBUTION TO THE PROPER STORAGE OF RADIUM

Professor Mühlbardt, Berlin, gave as his opinion from his extensive experience,

that the present way of storing radium may act quite harmfully on workers in close proximity to the safe containing the radium, even if the radium is in relatively small quantities. In his opinion, radium ought not to be stored in a place where people are working even for a few hours. Even a safe having a wall of lead block of 7 cm. thickness does not lend sufficient protection against the radium rays for individuals regularly working in close proximity to it. He suggests the building of a special room for the location of radium safes and though the room ought to be the size of a regular living room it ought not to be used for anything except the storage of radium.

ROENTGENOLOGICAL CONFERENCE

BALTIMORE, MARYLAND

The roentgenologists of Baltimore have invited the Roentgenological Conference (composed of the New England Roentgen Ray Society, New York Roentgen Society, Philadelphia Roentgen Ray Society, the radiologists of Washington, D.C., and the radiologists of Baltimore) to meet in Baltimore on February 6 and 7, 1931. The Lord Baltimore Hotel will be the headquarters of the meeting. Bus transportation will be furnished to and from the various meeting places.

It is contemplated having the opening session at the Johns Hopkins Hospital, Friday morning at 9 o'clock and the afternoon session at the University of Maryland Hospital. Entertainment will be provided for Friday night. Saturday the scientific session will be held at the Mercy Hospital. The Staff of the Howard A. Kelly Hospital will conduct a clinic on roentgen and radium therapy.

Those in charge of arrangements for the conference are: Dr. Charles A. Waters, Chairman, 1100 North Charles St., Baltimore, Md., Dr. Henry J. Walton, Secretary, 104 West Madison St., and Dr. John W. Pierson, Treasurer, 1107 St. Paul St. Additional information may be obtained by anyone interested in attending this conference by writing the Chairman.

OFFICERS ELECTED

At the recent annual meeting of the American Roentgen Ray Society at West Baden, Indiana, the following officers were elected for the ensuing year: President-elect: Leopold Jaches, New York City; 1st Vice-President: E. L. Jenkinson, Chicago; 2d Vice-President: E. P. Pendergrass, Philadelphia; Secretary: John T. Murphy (re-elected), Toledo, Ohio; Treasurer: Wm. A. Evans (re-elected), Detroit, Mich.; Librarian and Historian: E. H. Skinner, Kansas City, Mo.; Member of the Executive Council: Charles A. Waters, Baltimore, Md. The President of the Society is A. B. Moore, Washington, D. C.

Vol. XXIV, No. 5

DEPARTMENT OF TECHNIQUE

Department Editor: David R. Bowen, M.D., Pennsylvania Hospital, Philadelphia, Pa.

THE CIN-EX CAMERA

By HANS A. JARRE, M.D.

From the Department of Roentgenology, Grace Hospital

DETROIT, MICHIGAN

MEDICAL thought is paying increased attention to functional investigations. This tendency is quite apparent in the field of roentgenology, where for well-known reasons, anatomic studies have dominated from the beginning and will always play an important rôle. Roentgenoscopy has been the chief roentgenologic method of investigation of function. Its limitations in recognizing pathology are well known—faintness of a fleeting image, observation by one or a few only, lack of visual perception of the observer, and the impossibility of reproduction of the observations for reconsideration. Condemnation of the roentgenoscopic method and the demand of its replacement by serial roentgenography as advocated by leaders in roentgenology would not be regarded as a revolutionary step. We believe that both methods have their place and indication, and should be used with discrimination.

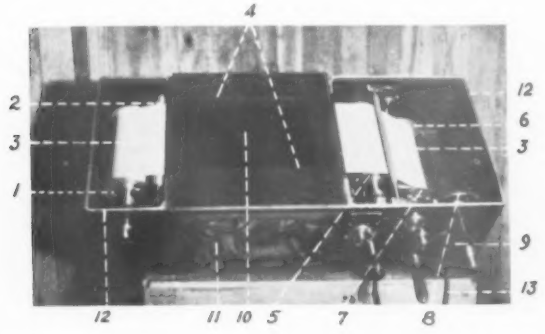


Fig. 1. Model 1. Camera with cover of right and left compartments removed. 1. Film spool, widths of 5, 6½, 8 and 10 inches may be employed at will. 2. Leveling roll. 3. Film band, widths of 5, 6½, 8 and 10 inches may be employed at will. Film bands are not perforated. 4. Diaphragm (lead) determining size of exposed section of film band. 5. Governing roll, advancing film band, exchangeable for different lengths of exposed sections: 7, 8½, 10, or 12 inches. 6. Spool receiving exposed film band. 7. Friction gear. 8. Timing gear; one-half of its circumference advancing film band, one-half activating clamping and releasing mechanism of intensifying screens (9) and energizing electrical timer. 10. Bakelite plate—upper. Its lower surface carries an intensifying screen. The second such plate cannot be seen as it is mounted below the visible one, carrying the intensifying screen on its upper surface; a fluoroscopic screen on its lower surface, to be viewed through a mirror underneath cloth hood (11). 12. Cast aluminum casing, lead lined. 13. Connection to electrical timer.

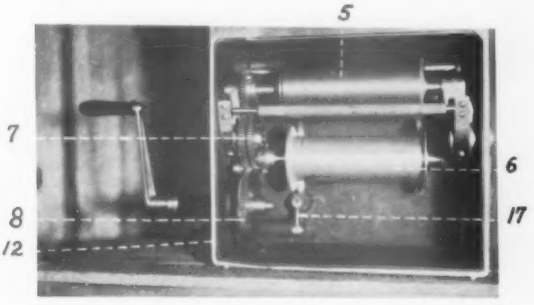


Fig. 2. Model 1. Mechanism of camera. Numbers identical with those in Figure 1. 17. Lever activating motion of lower intensifying screen from timing gear.

Suitable equipment for serial roentgenography has not been available in years past. Roentgen cinematographs heretofore constructed (Dessauer, Groedel, Ruggles) are not suitable for practical purposes, their inherent technical and economic limitations being quite evident. Available equipment for so-called serial exposures has not succeeded in producing a satisfactory record of motor phenomena of organs under investigation.

Equipment for functional roentgenologic studies must be able to secure records at a speed sufficient to permit of the analysis of individual cyclic motor phenomena, wherever they occur. Only one of the motor phenomena occurring in the human body requires true cinematographic study,

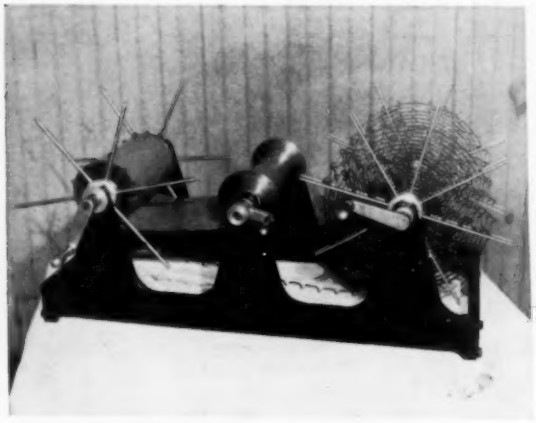


Fig. 3. Model 1. Equipment for processing film bands. The spider to the left when charged with exposed band and corrugated metal spacing bands is submerged in chemicals, the processing being governed by time exclusively.

preferably of slow-motion type—the function of the heart. It is questionable whether or not, in this instance, appreciable practical advantages could be obtained by the employment of such a method of study. It seems to us that all other motor phenomena, which may be registered roentgenologically, are so slow that serial exposures, executed at a slower rate of speed, ranging from one to three exposures per second, should be sufficient to permit of their proper evaluation. Equipment answering this purpose obviates the limitations of roentgen cinematography, compensates for the disadvantages of roentgenoscopy and therefore seems ideal for practical purposes, especially as it entirely eliminates the necessity for any other special installation, adapting itself to the average roentgenologic provisions. With such an apparatus we would expect to materially improve the roentgenographic method which then could be applied to physiologic investigation.

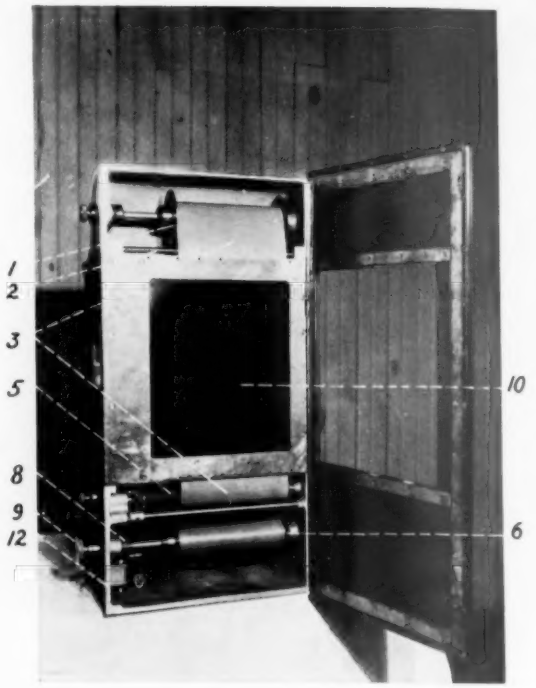


Fig. 4. Model 2. Motor driven camera, opened, may be utilized in any position, accommodating film bands of four different widths as in Model 1. Diaphragm removed. Motor not visible. Numbers identical with Figure 1 except: 5. Governing roll; gears to the left select desired length of exposed sections (see above).

Since the Fall of 1928 we have had under way design and construction of such an apparatus, which in combination with

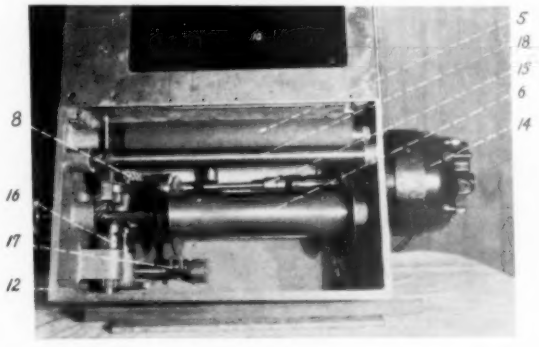


Fig. 5. Model 2. Mechanism of motor driven model. 14. Motor. 15. Driving shaft. 16. Brown-Sharp clutch. 8. Timing gear; its continuous revolution actuates three exposures per second. 18. Rubber mounted roll pressing film band against governing roll, 5.

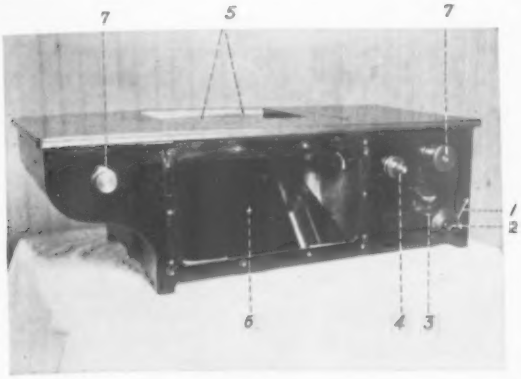
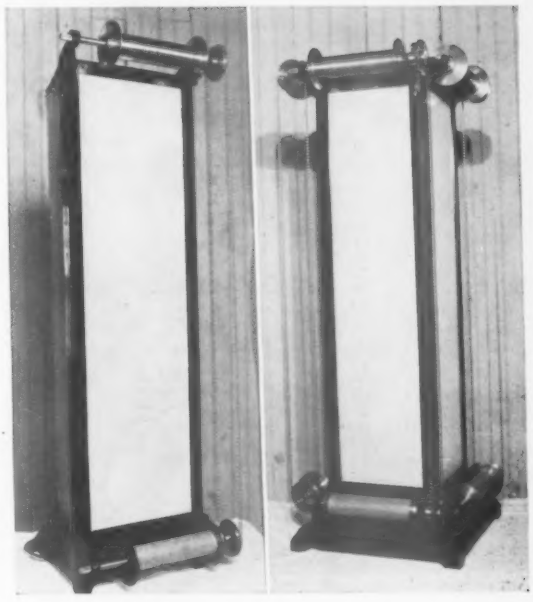


Fig. 6. Outer appearance of camera, cloth hood for roentgenoscopic observation of each exposure removed. 1. Motor switch. 2. Contact for roentgenoscopy. 3. Contact for exposure covered by protecting roof. 4. Shaft of gear, selecting desired length of exposed film sections (see Fig. 4—No. 5). 5. Diaphragm. 6. Mirror for visual observation of roentgenoscopic image (see Fig. 1—Nos. 10 and 11). 7. Rods mounting film spools.



a *b*

Fig. 7. Viewing stands for finished film bands. *a*. Single. *b*. Four illuminated surfaces. While we study and analyze our finished film bands on viewing stands as illustrated above, it is desirable to obtain reductions of such records on slide films and project them with an ordinary slide film camera for demonstration to an audience. Animated films may also be obtained from cin-ex camera films by proper reproduction as moving picture films.

standard roentgen equipment would perform the following cycle: Advancing of a film band to a determined position; clamping of a certain section of this band between intensifying screens; automatic exposure of this section by an electrically operated timer; releasing of the clamping intensifying screens from the film band and again advancing this band for one section, etc., speed 3 to 4 exposures per second. Two models of such an apparatus, which we have called the cin-ex camera, are completed and in operation at the Grace Hospital, Detroit. The accompanying illustrations show the two solutions of the technical problem.*†

* Dr. W. A. Babcock, Director of Grace Hospital, and the Board of Trustees have shown great interest in our work, and without their material help our results could not have been obtained. As stated above, the construction of a roentgen cinematograph was not contemplated. The present equipment, the hand operated as well as the motor driven model, answers our practical and research needs to complete satisfaction. It should be noted that the cin-ex camera can well be used for routine roentgenography of larger series of patients. Instead of shifting numerous cassettes, one may place patient after patient on the apparatus, make any number of exposures and develop one roll of film band instead of 20 to 80 cut films, care being taken to identify exposures correctly. Thus a great saving in time and handling may be accomplished.

† The two cameras were built by Mr. Albert Stoll, of the Central Tool and Engineering Company, Detroit. Mr. Stoll ingeniously produced all necessary designs, castings, etc., patiently overcoming the obstacles and adding improvements to the original conception. To him, therefore, I owe a great debt of gratitude.

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BOOK REVIEWS

Books Received Are Acknowledged under Heading: Books Received.' This must be regarded as a sufficient return for the courtesy of the sender. Selections will be made for review in the interests of our readers and as space permits.

Ergebnisse der Medizinischen Strahlenforschung (Röntgendiagnostik, Röntgen-, Radium- und Lichttherapie). (Advances in Medical Radiology (Roentgen Diagnosis, Roentgen, Radium and Light Therapy).) Volume IV. Edited by H. Holfelder, Frankfurt a. M., H. Holthusen, Hamburg, O. Jüngling, Stuttgart, H. Martius, Göttingen, and H. R. Schinz, Zurich. Paper, price 71 Marks; bound, price 74 Marks. Pp. 694, with 395 illustrations. Leipzig: Georg Thieme, 1930.

The high standard of this work has been kept up in the fourth volume which is now available to the physician interested in radiology.

In the first article, M. Lüdin (Basel) discusses the changes in form and position of the stomach due entirely to extragastric causes. The stomach itself is not diseased in such cases but some pathology in the neighboring organs, for instance, a cyst of the pancreas, ileus of the small intestine, or liver tumors are responsible for the deviation from the normal as observed in the roentgenogram. The same pathological process in the neighboring organs may cause entirely different deformities of the stomach outline; their interpretation is often difficult. The contribution of Lüdin gains in value because the majority of the cases reviewed here are controlled either by operation or autopsy.

Very instructive from the standpoint of differential diagnosis is the essay by K. Scheele (Essen), who points out how much help may be rendered by a pyelogram in the diagnosis of abdominal tumors. The files of V. Schmieden's clinic furnished part of the cases discussed by the author.

The next three articles deal with problems in light therapy. A. Adam (Leipzig) reviews the investigations in ultraviolet light and vitamin D and their rôle in the treatment of rickets. Ph. Keller (Freiberg), who is an acknowledged authority on light research, discusses the relations between pigmentation and light protection. The very extensive contribution of Adam (131 pages) gives an excellent idea of the present status of our knowledge concerning irradiated substances. In the third paper of this group, L. Schall (Homburg) has written a concise and critical presentation of the fundamental principles accumulated through experimental and clinical investigations of "The Light Erythema." The beginner will profit from its study and the worker in the field should enjoy reading Schall's essay.

Then follow "The Histology of the Uterine Carcinoma in its Relation to Radiation Therapy" by H. R. Schmidt (Düsseldorf), "The Principles of the Biological Healing of Carcinoma" by W. Lahm (Chemnitz), and "The Operated Stomach" by H. Meyer and W. S Schmidt (Göttingen). They are all well written and offer the reader interested in the various subjects valuable information. The book closes with a discussion of "Diathermy in Diseases of the Throat, Nose, and Ear" by E. Lüdecke (Bielefeld).

As in previous volumes, all contributions are well illustrated. The bibliographies appended to each article cover the international literature. This fourth volume deserves a place on the shelves of the roentgenologist's library.

Ernst A. Pohle

Normale Anatomie des Kopfes im Röntgenbild. I. Teil. (Radiologische Praktika, Band XII.) Von Karl Goldhamer, Leiter des Röntgenlaboratoriums an der I. Anatomischen Lehrkanzel (Prof. Tandler) in Wien. Cloth. Price, M. 120. With 30 photographic plates, 30 illustrative schemas and 15 projection diagrams. Leipzig: Georg Thieme, 1930.

The anatomy of the skull as depicted by the roentgenogram has been the subject of previous works of much merit. We have seen none which combines the excellent features of this volume, in support of which statement we submit the following:

1. Fifteen projections are presented, giving all positions for practical work.

2. Each projection is in duplicate, using both the dried skull with its great detail, and the living skull which reproduces actual working conditions.

3. Each of the thirty plates is carefully indexed, not in such manner as to mar the print but by sketching on transparent material all

skull markings, numbering them, and tabulating them on the opposite page.

4. The tabulations are given in four parallel columns in German, English, French and Spanish, making the book of universal scope, as well as enabling the roentgenologist to review and enlarge his knowledge of scientific terms in foreign languages.

5. All plates are photographic negatives, of natural size and excellent detail.

A minor criticism might be made of the use of a plate which shows a pathological condition, namely a clouded antrum. This slight fault does not, in our opinion, detract from the value of this estimable work which must be seen to be truly appreciated.

E. W. Hall

The Beginnings: Egypt and Assyria. (Clio Medica, Volume I.) By Warren R. Dawson, F. R. S. E., Fellow of the Royal Society of Medicine, of the Society of Antiquaries of Scotland, and of the Royal Anthropological Institute of Great Britain and Ireland. Cloth. Price, $1.50. Pp. 86. New York: Paul B. Hoeber, Inc., 1930.

This book is the initial volume of a series called "Clio Medica" which is to be written by a series of authors with Dr. E. B. Krumbaar as editor. The volumes are to be conveniently small and inexpensive but written by recognized authorities in the various fields. The first volume has been written in a readable and pleasant style by an author who has made a careful study in this particular field and based his conclusions on original observations from reliable sources such as the Egyptian medical papyri. The contents of the book are conveniently grouped into eight chapters as follows:

I. Primitive Ideas of Disease and Death.
II. Averting Death and Prolonging Life.
III. The Magician.
IV. The First Medical Books.
V. Ancient Egyptian Medicine.
VI. The 'Pothecary.
VII. Assyrian Medicine.
VIII. The Legacy of the Past: Conclusion.

The editor is to be congratulated on introducing such an admirable plan of dealing with the various phases of the history of medicine. The medical profession at large, as well as undergraduate medical students, would profit greatly from an intellectual, as well as a practical standpoint, if they have a knowledge of the historic development of the art and sciences of medicine. It is hoped that the subsequent volumes will maintain the high standard of the first contribution to "Clio Medica."

The author has very thoughtfully included a bibliographical note for those who wish to investigate further the subjects outlined in this book.

C. C. Sturgis

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ABSTRACTS OF ROENTGEN AND RADIUM LITERATURE

ROENTGEN DIAGNOSIS

HEAD

Laszlo, Edith. Ein Beitrag zur Röntgendiagnostik raumbeengender Prozesse in der Schädelkapsel. (Contribution to the roentgen diagnosis of space-narrowing processes in the cranium.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, April, 1930, *41*, 636–638.

In a patient with increased intracranial pressure a shift (to the right) and a rotation (around its longitudinal axis) of the pineal gland was observed on the roentgenograms taken by the usual technique and it was suspected that the changes were brought about by a brain tumor. The injection of air confirmed the diagnosis. At the post-mortem examination a huge cystic tumor was found. The case is described in order to call attention to the fact that the study of the shadow of the pineal gland may under certain circumstances be of considerable diagnostic value.—*T. Leucutia.*

Pesme, Paul. Étude radiologique d'un cas de maladie de Crouzon. (Roentgen study of a case of Crouzon's disease.) *Bull. et mém. Soc. de radiol. méd. de France*, March, 1930, *18*, 149–151.

Crouzon in 1912 for the first time described an interesting and rare affection, so-called hereditary cranio-facial dysostosis, characterized by three cardinal symptoms: (1) cranial malformation; (2) facial deformity, and (3) ocular disturbances.

The author has recently reported 2 similar cases, and in the present article he describes a third. The patient was a girl four years of age who on physical examination presented an oxycephalic cranium (with an eminence in the form of an elongated crest along the sagittal suture), a marked atrophy of the maxillae (with atresia of the nasal fossae and a parrot-beak shaped nose) and a very marked exophthalmos.

The roentgenograms of the skull showed a dome or tiara shaped malformation of the cranial cap with obliteration of the osseous sutures and a hammered (paper thin) appearance of the tables; a sinking in (lordosis) of the middle fossa with nearly vertical orientation of the sella turcica, and a very marked atresia of the maxillae with diminution of the size of the orbital cavities.

The general condition of the patient was good except for headaches and difficult nasal respiration. The intelligence was normal. No other members of the family were affected. A reëxamination six months later revealed increase in the exophthalmos and a beginning optic atrophy indicating that blindness, which is the most dreaded complication of the disease, had started.—*T. Leucutia.*

NECK AND CHEST

Podlasky, H. B., and Kohn, S. E. Thymic shadows of new born infants. *Am. J. Dis. Child.*, April, 1930, *39*, 782–789.

Podlasky and Kohn made roentgen examinations of 100 consecutive new-born infants during the first twenty-four hours of life. Although an effort was made, it was not always possible to obtain these pictures in the same phases of respiration. However their technique, they state, remained constant, that is, a distance of 30 inches, one-eighth of a second exposure, at 25 ma. and 55,000 volts. They accepted as their criterion for thymic enlargement, any increase in width of the mediastinal shadow beyond one and one-third times the width of the bodies of the thoracic vertebrae. They quote extensively from the papers of Wasson. They consider the posteroanterior position in recumbency at full inspiration as the best position for examination of the thymus. No mention is made of the lateral position and the possibility of pressure on the trachea by the enlarged thymus as has recently been emphasized by Jackson, Pancoast and Pendergrass.

Of the 100 infants, 35 showed definitely enlarged thymic shadows, that is, the width at the second thoracic vertebra proved to be more than twice that of the latter's transverse diameter. Whether the month of birth has any relation to size of the thymus could not be ascertained as all the infants studied were born during the months from July through November. Sex apparently did not play an

important rôle. The birth rate seemed to have some definite bearing on the size of the gland, the heaviest infant perhaps having the largest gland. Whether position in utero and difficulties in delivery have any bearing is considered by them to be still an unanswered question. The left occipital anterior position occurred in 13 of the 35 children showing enlarged shadows, the right occipital anterior in 9, the left occipital posterior in 3, the right occipital posterior in 4, breech in 3, and in 3 children the position was not stated. The cry at birth, in spite of the fact that the mother was either partially or completely anesthetized, was vigorous in 26 of the 35 infants; in 2, it was fair, but prompt; in 3 it was poor, and in only 4 was it delayed, and in these instances it was associated with difficulty in resuscitation. Cyanosis was noted in only 2 infants; in one it was marked, and in one, rather slight. In neither instance was it associated with stridor, and in neither instance did it persist. A stridor was noted in but one infant, and it was not associated with any other symptom suggestive of thymic enlargement. Twenty-nine of the 35 infants took food well after the first day; 3, fairly well, and 3, rather poorly. However the primary rise in weight was noted on the second day in 4, on the third day in 12, on the fourth day in 11 and on the fifth day in 2, showing little diversion from the normal. In every instance the child was active and alert and was discharged on or about the tenth day with all evidences of being a normal infant.—*R. S. Bromer.*

Chaumet, G. Les pleurites et cortico-pleurites apicales. (Pleuritis and apical cortico-pleuritis.) *Bull. et mém. Soc. de radiol. méd. de France*, March, 1930, *18*, 111–117.

The author expresses the opinion that the visualization of the apical pleura represents a localized pachypleuritis or cortico-pleuritis. In the initial stage the clinical findings may be entirely negative, while later the lesion is often associated with discrete parenchymal involvement.

The frequent occurrence of adhesions and thickenings of the pleural domes at autopsy supports the theory that apical pleuritis and cortico-pleuritis are more common than hitherto supposed.—*T. Leucutia.*

Arkussky, I. Das Röntgenbild der angeborenen Stenose der Lungenarterie bei gleichzeitiger Existenz eines Defekts der Kammerscheidewand. (The roentgen image of congenital stenosis of the pulmonary artery with simultaneous defect of the ventricular septum.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, April, 1930, *41*, 617–626.

Four cases of congenital stenosis of the pulmonary artery cum Roger are described in detail and their clinical and roentgen characteristics discussed.

The conclusion is reached that the orthodiagraphic study of the configuration of the heart in various positions is of great aid in establishing a correct diagnosis.

It is interesting that in all instances there was a remarkable functional adaptation of the heart, maintaining a practically normal circulation. However, as soon as pulmonary complications arose the heart failed to produce proper compensation and 2 of the patients died. In the 2 others pulmonary lesions have appeared more recently and it is doubtful whether they will survive. Thus the prognosis in congenital stenosis of the pulmonary artery cum Roger must remain serious.—*T. Leucutia.*

Galifi, Liborio. La linea capillare nel campo polmonare destro. (The capillary line in the right lung field.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 132–145.

Not infrequently roentgenograms of the thorax show a delicate opaque line passing through the middle of the right lung field, generally transversely, sometimes obliquely at a level between the second and fourth ribs. It is a very delicate capillary line and is to be differentiated from much heavier and irregular lines sometimes seen which are due to definite interlobar pleurisy and from a subcapillary line demarcating an azygos lobe. The differentiation between the latter line and the capillary line in question is sometimes difficult. While it is generally recognized that the large and subcapillary lines represent pathological conditions of the interlobar fissure there has been a great deal of discussion as to whether the capillary line represents a beginning interlobar pleurisy or merely a normal incisure. The frequency with which it is found in apparently normal thoraces would argue in favor of the latter supposition. It is further supported by the fact that these capillary lines are rarely seen in children under five years of age. This brings up the question of whether the line is

to be considered pathological only in young children. It would be an interesting study to determine whether there is any relation between the capillary line and primary tuberculous infection in early childhood. The author describes 5 cases in which the capillary line was seen in roentgen examination of the thoraces of young children. The first 3 had definite lung and gland tuberculosis while the other 2 showed lung lesions suspicious of tuberculosis. The cases are too few to be conclusive but the author thinks them suggestive.—*Audrey G. Morgan.*

BUSI, A., and PAOLUCCI, R. Indagini sulla percentuale di tubercolosi latenti e di complessi primari accertabili radiologicamente tra la popolazione infantile di una zona rurale. (Percentage of latent tuberculosis and primary complexes demonstrable roentgenologically in the children of a rural district.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 126–131.

The authors studied 292 children from six to nine years of age in a rural district. They tried to find out the family history, the possible conditions of contagion, the constitutional characteristics, the method of feeding during nursing and weaning, the habits of life, hygiene of the dwellings, etc. They measured weight, height and circumference of the thorax. They found the measurements defective in 66.1 per cent of the cases, which they attribute to the poverty of the families. They found that 64.9 per cent of the children with lesions that could be demonstrated roentgenologically belonged to families with a history of tuberculosis. In 60 per cent of the cases there was a history of measles, in 50 per cent of whooping cough, in 20 per cent of influenza, in 12 per cent of pneumonia, in 1 per cent of pleurisy and in 75 per cent of ascariasis. In 25 per cent there were adenoids, in 40 per cent enlarged cervical glands and in 37 per cent general enlargement of the glands. The gland enlargements were not specific.

The technique used in the roentgen examinations was: Coolidge tube, Cardolle apparatus, focus skin distance 80 cm., 60 ma., spark gap 8–9 cm.; 1/10 to 1/20 second exposure, ventral decubitus, inspiratory apnea. Films 24×30 were used so that the subdiaphragmatic region could also be examined.

The lesions seen in tuberculosis in childhood are: Ranke's primary complex, perifocal inflammation, subacute miliary tuberculosis, chronic tuberculosis and progressive pleural lesions. The authors did not find any cases belonging in the 3d and 4th of these groups. The primary complex may escape detection because it is small and not very dense. They found 2 active cases in the form of small caseous masses with enlargement of the tracheobronchial glands, which in 4 cases were calcified; in 2 cases there was only enlargement of lymph glands and in 4 cases only calcification of solitary hilus glands. Perifocal inflammation is an inflammatory infiltration around a tuberculous focus. They found it in 4 cases. They found plastic pleurisy in only one case.

There were tuberculous lesions definitely demonstrable roentgenologically in 6.5 per cent of the cases, and suspicious signs in 4.1 per cent, making a total of 10.6 per cent. There were definitely positive tuberculin reactions in 12.5 per cent of the cases and, including the suspicious ones, in 21 per cent of the cases. The authors conclude that roentgen examination may show tuberculous lesions before clinical examination does.

They emphasize the importance of making a roentgen examination of the thorax in children the first year they begin school and one every year after that so as to determine the roentgen anatomy of the respiratory tract and heart with relation to the region in which the child lives, his constitution and progressive development up to puberty. This, in connection with the personal and family history and physical examination would give a thorough knowledge of tuberculosis in childhood, its aggravation after certain infections and the nature of the first manifestations of tuberculous reinfection.—*Audrey G. Morgan.*

ST. DEDIĆ. Cor bovinum in der Differentialdiagnose. (Differential diagnosis of cor bovinum.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, April, 1930, *41*, 589–597.

Cor bovinum, although it represents a general enlargement of the heart, on closer analysis usually reveals signs which permit the recognition of the fundamental organic lesion (mitral, aortic, tricuspid insufficiency, etc.). As a rule no great difficulty is encountered in making a correct diagnosis.

When the enlarged heart shadow, however, is due to the presence of fluid within the pericardium, the problem may become very complex. After describing 8 cases more or less in detail, the author arrives at the conclusion

that the following signs are of particular value: A cor bovinum shows only slight variation in the form and position of the heart in serial orthodiagraphy, while in pericardial effusions this may be considerable (especially when changing the position of the patient). If the exudate or transudate exceeds the amount of 1 liter the heart assumes a tobacco pouch appearance, while in exudates of moderate amount (0.5 liter) it becomes triangular and in transudates of moderate amount (0.5 liter) it conforms to the configuration of the pathological heart. —*T. Leucutia.*

Vischia, Quintino. Studio radiologico e clinico sui rapporti tra vizii mitralici e tubercolosi polmonare. (Roentgen and clinical study of the relation between mitral lesions and pulmonary tuberculosis.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 11–20.

It is an old belief that there is an antagonism between acquired heart lesions and tuberculosis, and particularly between mitral lesions and tuberculosis. The author reviews the literature of the subject and has found from his own work that the coexistence of mitral lesions and pulmonary tuberculosis is not infrequent. He has seen both stenosis and insufficiency of the mitral valve in tuberculosis. Illustrative roentgenograms are given. —*Audrey G. Morgan.*

Bársony, Theodor, and Koppenstein, Ernst. Lobus apicodorsalis (eine bisher unbekannte Lokalisation des Azygoslappens). (Lobus apicodorsalis, a hitherto unknown localization of the azygos lobe.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, March, 1930, *41*, 459–466.

The authors observed an unusual appearance of the azygos lobe in 3 (later 4) cases. In the posteroanterior view there was evidence of a slightly convex linear shadow in the region of the right apex which on examination in the lateral view (according to the authors' technique) proved to be the roentgen expression of the lower border of the azygos lobe. Since the condition is localized posteriorly and to the apex of the lung the name of lobus apicodorsalis is suggested. In the lateral view, this lobe appears oval shaped, the long axis forming an angle of 45° with the vertebral column. —*T. Leucutia.*

Airale. Echinococcosi polmonare secondaria e sedi di sviluppo. (Secondary echinococcus of the lung and its site.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 150.

Some authors say that the site of predilection of secondary echinococcus cyst of the lung is the lower lobe because from a primary localization in the liver the organisms pass through the diaphragm into the lower lobe of the right lung. Others say that the site may be anywhere in the right lung because of the larger caliber of both the vessels and bronchi. But surgical findings have shown that echinococcus cysts may develop in either the right or left lung. The author presented a case of diffusion through the bronchi of many small daughter cysts implanted in different lobes of the lung as a result of spontaneous rupture of an echinococcus cyst at the hilus. But this method of diffusion is not frequent, as shown by another case of spontaneous rupture of an echinococcus cyst in a lobe of the lung which did not result in dissemination.—*Audrey G. Morgan.*

Delherm and Morel-Kahn. Diagnostic des tumeurs du poumon chez l'adulte. (Diagnosis of tumors of the lung in the adult.) *J. de radiol. et d'électrol.*, March, 1930, *14*, 158–169.

The authors discuss the diagnosis of intrathoracic tumors from the point of view of their roentgen appearance. Two main groups are distinguished: (1) tumors showing a rounded, and (2) tumors showing an irregular appearance. In the first group differential diagnosis includes pulmonary abscess, encysted pleural effusion and aneurysm of the aorta. The tumor may be benign (dermoid cyst, fibroma, hydatid cyst) or malignant (sarcoma, primary carcinoma). In the second group the following forms are distinguished: (*a*) lobar form (differential diagnosis including tuberculosis); (*b*) juxta mediastinal forms (differential diagnosis including pulmonary sclerosis, mediastinal tumor, tuberculous hilar adenopathy); (*c*) mediastino-pulmonary forms (differential diagnosis including massive tuberculosis); (*d*) cavitary forms (differential diagnosis including pulmonary cavity and abscess), and (*e*) pleural form (very rare).

In most instances the roentgen examination must be supplemented with clinical procedures (exploratory puncture, demonstration of en-

largement of the adjacent lymph nodes), surgical exploration (biopsy), and the so-called roentgen therapeutic test dose, in order to arrive at a correct diagnosis.—*T. Leucutia.*

BAUERMEISTER, W. Zur Genese der sog. idiopathischen Ösphagusdilatation. (On the genesis of the so-called idiopathic esophageal dilatation.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, April, 1930, *41*, 626–630.

Esophageal dilatation may be divided into two stages, each of which comprises two phases. In the first phase of the first stage there is evidence of esophageal atony with delayed passage of the opaque medium. In the second phase of the first stage (classical phase) there is paralysis of the esophagus and a spasm of the cardiac end, reaching, as a rule, above the diaphragm. In the first phase of the second stage there is evidence of residue with gradual dilatation of the esophagus reaching below the diaphragm, and in the second phase of the second stage there is an enormous dilatation and elongation of the entire esophagus.—*T. Leucutia.*

BEUTEL, ALOIS, and MAHLER, PAUL. Zur Symptomatologie und Diagnose der kardianahen Magendivertikel. (On the symptomatology and diagnosis of cardiaproximal diverticula of the stomach.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, April, 1930, *41*, 630–635.

Two procedures are of special value in the diagnosis of diverticula of the cardiac end of the stomach: (1) the roentgen study of the relief of the mucous membrane and (2) the direct gastroscopic examination.

For the demonstration of the folds of the mucous membrane, it is best to adminster a thick barium mixture and after this has entered the diverticular sac to express the contents of the sac by manipulation and placing the patient in the most favorable position. Differential diagnosis includes niche, carcinoma crater and hernia of the esophageal hiatus.

The gastroscopic examination is done directly and the appearance of the folds leading to the diverticular opening is studied. The differential diagnosis here includes niche and spastic contractions.—*T. Leucutia.*

DILLENSEGER. Un cas d'éventration diaphragmatique. (A case of eventration of the diaphragm.) *Bull. et mém. Soc. de radiol. méd. de France*, March, 1930, *18*, 89–94.

A peculiar U-shaped reversal of the barium filled stomach was observed in a man aged fifty-six suffering from diaphragmatic eventration.

The case was easily differentiated from a true diaphragmatic hernia due to the fact that the diaphragm appeared above the gastric shadow, while in hernia the stomach enters through the diaphragm into the thoracic cavity. There was a marked elongation of the mesoduodenum. This, together with the rudimentary appearance of the left lung and dextrocardia, suggested that the condition was of a congenital nature.—*T. Leucutia.*

DIDIÉE. Radiographie du thorax en position transverse: Aspect normal. Images pathologiques. (Roentgenography of the thorax in transverse position; normal aspect; pathological images.) *Bull. et mém. Soc. de radiol. méd. de France*, March, 1930, *18*, 101–106.

The author discusses in detail the roentgen appearance of the chest in the true lateral position and arrives at the conclusion that the method is of great value in the study (1) of organs permitting demonstration by opaque media; (2) of isolated or associated pleural and intrapleural processes; (3) of the mediastinum and hila, and (4) of the heart and especially great vessels.—*T. Leucutia.*

ABDOMEN

BLOND, KASPAR. Cholezystographie und Funktion der Gallenblase. (Cholecystography and function of the gall-bladder.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, April, 1930, *41*, 571–581.

The author, after discussing the various theories of the function of the gall-bladder arrives at the conclusion that the assumption that the gall-bladder empties (through the cystic and common duct) into the duodenum is erroneous. The following facts are cited in support of this view: (1) the presence and structure of Heister's values; (2) the peculiar blood supply of the gall-bladder (the cystic vein opens into the portal vein); (3) the fact that no instance is known in which a fluid can flow in two directions at the same time; (4) the mucous membrane of the gall-bladder is provided with epithelium which absorbs not only water, salts and dyes, but all other substances of the bile; (5) the gall-bladder possesses only

muscularis mucosa and not muscularis propria; (6) the sphincter of Oddi is without physiologic significance, and (7) in some animals (*Macacus rhesus*) and not infrequently in humans, part or the entire gall-bladder is imbedded within the parenchyma of the liver, a circumstance which contradicts actual contraction.

The functional method by duodenal aspiration does not prove motility of the bile ducts but is simply a functional test of the liver. This is true also of cholecystography. The present interpretations of cholecystograms are based on the assumption that the cystic duct represents the outlet of the gall-bladder, while the outlet really is the cystic vein. The emptying of the gall-bladder following the administration of egg yolk is explained through a retrograde resorption of the bile from the gall-bladder into the liver, there being at the same time a marked absorption through the mucosa of the gall-bladder. The author therefore expresses the opinion that a further study of the physiologic processes of the bile system is necessary before one will be able to arrive at a proper interpretation of the roentgen findings in cholecystography.—*T. Leucutia.*

Bauer, Richard, and Strasser, Ulrich. Cholecystographie und Leberfunktion. (Cholecystography and liver function). *Klin. Wchnschr.*, March 15, 1930, *9*, 487–491.

More recently Graham has introduced the use of the isomer phenoltetraiodophthalein for the liver function test in connection with cholecystography. A retention of 14 per cent of the dye in the blood serum half an hour and 4 per cent one hour following the intravenous injection indicates a normal function, while a greater concentration is indicative of some pathological condition.

The author expresses the opinion that a dye cannot be used for the determination of the liver function for the simple reason that the excretion of the dye through the liver depends on the following five factors: (1) the type of biliary flow in the intra- and extrahepatic gall ducts; (2) the function of the reticuloendothelial system; (3) the function of the liver cells; (4) the general and hepatic blood supply and (5) the amount of reabsorption of the dye excreted with the bile into the intestinal tract.

In order to check up on the above more or less theoretical considerations, the author engaged in a series of experiments by administering the dye by the oral method and by injecting at the time of the first roentgenogram 350 mg., that is, 5 c.c. of a 7 per cent solution of phenoltetrachlorphthalein (chlor-cholegnostyl Gehe) intravenously, the blood being examined two hours later for the retention of the dye. The percentage of the retention was then checked against the cholecystographic findings as well as against the galactose, icteric and diazo tests of the blood serum and against the quantitative bilirubin and urobilinogen tests of the urine.

The series included 125 cases, 21 of which were cases with icterus catarrhalis. Eight of these, as well as one of salvarsan icterus, were studied for a longer period and their findings were tabulated.

It was found that the cholecystographic visualization of the gall-bladder (by the oral method) depends on the dye excretion of the liver, which in turn is dependent on the normal biliary excretion. Thus in icterus catarrhalis (during the clearing up phase) and especially in nonicteric cirrhosis of the liver, in spite of a marked galactosuria, the dye excretion remained practically normal and a good gall-bladder shadow was obtained. Only in case of complete or nearly complete icterus was there nonfilling of the gall-bladder. In nonicteric diseases the lack of filling of the gall-bladder did not always indicate a disturbance of the liver function. Thus in diabetes mellitus, morbus basedowii and nonicteric liver cirrhosis, there was often non-filling of the gall-bladder, the reason for this remaining entirely unexplained.

The conclusion is reached that the liver function test in conjunction with cholecystography (oral method) is of little clinical value. In exceptional nonicteric cases as, for example, atrophic cirrhosis, amyloid and fatty degenerations, etc., cholecystography may eventually be combined with the cholegnostyl test. If the retention (at two hours) does not exceed 15 per cent one may expect a normal gall-bladder shadow.—*T. Leucutia.*

Cottone, G. Ombre di tinta calcare nell'-ipocondrio destro. (Calcareous shadows in the right hypochondrium.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 233–234.

The author demonstrated a case in which the roentgenogram of an adult man showed two spots the size of filberts in the liver shadow.

The patient had been admitted with the clinical diagnosis of chronic purulent cholecystitis. The two shadows were made up of concentric stripes, calcareous stripes alternating with transparent ones. They were in the ventral plane, moved with the liver shadow on respiration and the distance between them remained constant. They could not be displaced laterally. Operation showed cholecystitis and showed that the shadows were caused by two little tumors just beneath Glisson's capsule on the posteroinferior surface of the liver, one near the lower border, the other near the hilus. Histological examination showed that they were calcified echinococcus cysts.—*Audrey G. Morgan.*

PICCININO, G. Ernia diaframmatica del colon. (Right diaphragmatic hernia of the colon.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 150–164.

Roentgen examination has shown that diaphragmatic hernia is more frequent than it was formerly supposed to be. It has also shown that traumatic hernia is relatively rare in comparison with the congenital form. The hernias may be divided into true ones with a sac and false ones without a sac. The hernia may take place either through a normal opening in the diaphragm or through a congenitally weak spot.

A case is described in a man of twenty-eight who had always been well. After an emotional disturbance he had constipation and abdominal pain. As purgatives had no effect on the constipation and the pain grew worse a physician was called in who made a diagnosis of appendicitis. After six or seven days the pain passed off and the patient was sent for roentgen examination, not for confirmation of the diagnosis but to determine whether operation was necessary. Roentgen examination showed a part of the colon in the thorax. A barium enema rose into the part of the colon in the thorax and returned to the abdominal part. The part of the colon that remained in the abdomen was in the shape of a reversed V. The thoracic part of the colon lay to the right of the midline. It was a parasternal hernia passing through one of the congenitally weak points in the diaphragm. This variety of parasternal hernia is quite rare. Such hernias may exist for a long time without causing any symptoms at all. But the attack of pain in this case shows that such a patient is always in danger. But notwithstanding all the improvements in surgery, operation for diaphragmatic hernia is not free enough of danger to be recommended in a perfectly healthy subject. The best thing to do is to keep the patient under observation and be ready to operate at the first sign of complications.—*Audrey G. Morgan.*

CATALANO, ORLANDO. Piopneumotorace subfrenico da perforazione di ulcera del colon con dimostrazione radiologica del tragit to fistoloso. (Subphrenic pyopneumothorax from perforation of an ulcer of the colon with roentgen demonstration of the fistula.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 165–176.

A man of forty-three had a history of attacks of abdominal pain for about twenty years. He had been able to control it by diet and had not had constipation or icterus. About two weeks before examination he suddenly had intense pain in the epigastrium after a rather heavy meal with vomiting and rigidity of the wall of the abdomen. He had constipation for several days and after that tarry stools. After a few days his condition improved. He had only had moderate fever but after about two weeks, on the day that he came to the author for examination, he had an attack of fever preceded by a chill. Roentgen examination showed an area of air and liquid in the outer half of the right hypochondrium; in the lower part of it there was a liquid level that moved readily when the patient moved. All the right border of the liver appeared to be detached from the wall of the abdomen as if artificial pneumoperitoneum had been performed. The picture was very similar to that in perforation of the stomach and duodenum but examination showed that these organs were normal. Some days later an enema was given and at the hepatic angle of the colon a part of the barium passed through a fistula to the accumulation of air and liquid mentioned above. The fistula was still partially visible after twenty-four hours. Surgical operation was performed and punctures made at the site of the accumulation of gas. It was thought best not to open the peritoneum for fear of disseminating the infection. A small amount of purulent liquid and a little gas was removed. The fever fell after the operation and the patient's general condition improved. But later fluid formed in the right pleura which had to be removed. The author thinks the perforation was produced by a simple ulcer of the colon.—*Audrey G. Morgan.*

Pignataro, E. L'indagi'ne radiologica nella sifilide del tubo gastro-enterico. (The roentgen picture of syphilis of the gastrointestinal tract.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 1–10.

The roentgen picture of syphilis of the stomach is variable and confused because syphilitic tissue is constantly dying and being regenerated. The author describes 2 clinical cases in one of which the picture suggested ulcer and in the other stenosis of the pylorus. He reviews the literature on the subject of the roentgen findings in syphilis of the stomach and concludes that it is often mistaken for that of ulcer or carcinoma. As the picture of syphilis is variable and not characteristic it may readily be mistaken for that of other lesions. If the therapeutic test for syphilis were tried before operation for such conditions it would save many patients from operation who are operated on merely on Haudek's syndrome.—*Audrey G. Morgan.*

Brdiczka, I. G. Antrum-Pseudodivertikel des Magens, ein Röntgenbefund bei operativ gedecktem Ulcus duodeni perforatum sowie chronischem Ulcus mit perigastrischen Adhäsionen. (Pseudodiverticula of the antrum of the stomach; a roentgen finding in surgically covered perforated duodenal ulcer, and in chronic ulcer with perigastric adhesions.) *Fortschr. a. d. Geb. d. Röntgenstrahlen.* March, 1930, *41*, 384–392.

Seven cases of pseudodiverticula of the antrum of the stomach (4 of which were confirmed at operation) are briefly described and their roentgenograms presented.

The conclusion is reached that the pseudodiverticula of the antrum may be the result of the surgical covering of perforated duodenal ulcers by a flap of omentum or of certain chronic ulcers resulting in very extensive perigastric adhesions.

Differential diagnosis includes prepyloric ulcers with spasm of the greater curvature. The constant absence of the niche, the lack of sensitiveness on pressure, a peristalsis of the prepyloric pocket and a two-hour residue in the pocket make the diagnosis of pseudodiverticulum of the antrum rather certain. In a few instances it is necessary to use atropinization. From a practical standpoint one may say that (1) if a pseudodiverticulum of the antrum is accompanied by marked deformity of the bulb, a prepyloric ulcer can be ruled out with certainty; (2) if a pseudodiverticulum is accompanied by only a slight deformity of the bulb the possibility of a duodenal ulcer must be considered, and (3) if the bulb is entirely normal the pseudodiverticulum is most probably the result of a spastic contraction of the antrum from a prepyloric ulcer.—*T. Leucutia.*

Darbois and Sobel. Note sur l'examen radiologique d'une perforation duodénale. (Roentgen examination of a duodenal perforation.) *Bull. et mém. Soc. de radiol. méd. de France*, March, 1930, *18*, 85–89.

A case of duodenal ulcer with perforation is described in a man thirty-five years of age who came to roentgen examination with rather vague symptoms, no perforation having been suspected.

The following three roentgen signs were of special value: (1) the coexistence of a typical duodenal ulcer with an atonic, immobile, fixed stomach (although this appears paradoxical since one would expect hyperkinesia with spasticity of the pylorus); (2) the presence of gas around the duodenum (in the authors' case a drop of barium passed into the peritoneal cavity); (3) the presence of gas in the peritoneal cavity, especially underneath the diaphragms. In connection with this latter sign, it is advised that if no air can be demonstrated in the peritoneal cavity, the patient be placed on the left side for a period of thirty to forty minutes and then reëxamined. A small quantity of air will pass into the peritoneal cavity, even in very small perforations.

The author performed a number of experiments in cadavers by forcing air into the stomach by means of a Faucher tube, and by perforating the duodenum with a stylet through the abdominal wall. Air passed most freely into the peritoneal cavity when the cadaver was placed in the left lateral position.—*T. Leucutia.*

Cottone, G. Diverticolo duodenale in duodeno libero. (Diverticulum in a free duodenum.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 177–180.

There is a great deal of literature on diverticula of the duodenum and also on abnormalities in the position, direction and length of the different sections of the duodenum, but the author has never seen a report of a case in which the

two abnormalities were combined. He describes and presents roentgenograms of a case in which the first portion of the duodenum was normal in site, shape and direction; the second part descended obliquely and a little to the right; this was followed by a tract on the right which showed a coil like a loop of mesentery. In this tract there was a diverticulum the size of an apple. Its walls did not show any peristalsis but its mouth opened and closed like a sphincter. Nine hours after the barium was taken the diverticulum alone could be seen at the level of the 4th lumbar and a little to the left of the midline. The patient was a man of fifty who had never had any illness except that he had had icterus for about three weeks while in military service in 1915. He had often had acidity and this had recently increased in frequency, intensity and duration, accompanied by epigastric pain such as that usually seen in ulcer of the duodenum. A few days before the examination his stools had for the first time presented a coffee-ground appearance. There were no signs of ulcer elsewhere in the digestive tract and the author concludes that this was a case of ulcer in a duodenal diverticulum in a free duodenum. He thinks there is no doubt that the diverticulum was a true congenital one.—*Audrey G. Morgan.*

TALIA, F. Sui tumori dell'ansa terminale dell'-ileo. (Tumors of the terminal loop of the ileum.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 180–183.

Tumors of the terminal loop of the ileum are unusual. From 1925 to 1929 the author has seen 9 cases, 2 of sarcoma, 2 of carcinoma, 1 syphilitic, 2 tuberculous and 2 inflammatory. The 2 cases of sarcoma were in patients fourteen and twenty years of age and were controlled by operation. In the first the roentgen signs were characteristic of stenosis of the intestine with a defect in filling not far from the ileocecal valve. In the other the stenosis was more intense. There was a thin strip of barium joining the terminal loop of the ileum and the ileocecal valve. The tumor was very large and palpable clinically, while roentgen examination showed the cecum dislocated upward and deviated by compression of the tumor above it.

Of the 2 cases of carcinoma the first was in a patient of thirty-seven and secondary to a carcinoma of the cervix of the uterus in a patient who had had radium and roentgen treatment for the primary tumor. Roentgen examination showed irregularity in the form and function of the terminal part of the ileum and a fixed angle which could not be moved on manual manipulation under the screen; there were slight and irregular defects of filling in two different zones of the terminal ileum not far from the ileocecal valve. In the second case, in a man of fifty, the filling defect was ileocecal. There was no history of a primary tumor elsewhere; the patient refused operation. Now two months after the roentgen examination he is in serious condition with cachexia.

The first of the two cases of tuberculosis was in a man of thirty-one with open pulmonary tuberculosis. Recently he had begun to show signs of stenosis, while palpation showed a hard irregular mass. Roentgen examination showed a distinct gap between the ileum and ascending colon while only the bottom of the cecum filled; in addition to this irregularity, there were all the roentgen signs of stenosis. This patient was greatly improved after two months of roentgen treatment. The other case was in a woman of twenty-two. Clinically there were all the signs of intestinal tuberculoma and roentgenologically there was a distinct gap between the terminal ileum and the cecum. Operation showed a mass of hyperplastic glands involving the terminal ileum and extending to the right adnexa.

The syphilitic case was in a woman of thirty-nine in whom syphilis had been demonstrated clinically, serologically and roentgenologically. Roentgen examination showed a thin strip of barium uniting the terminal part of the ileum with the colon; functionally there was retardation in the passage of the barium meal and absence of peristalsis. The loop above showed some dilatation.

The first patient with an inflammatory tumor, a man of thirty-two, had had a trauma with severe entorrhagia. After some years two palpable tumors developed, one in the umbilical region and the other on the right. They increased slowly in size without causing any symptoms. Roentgen examination showed a stenosis of the jejunum and a second more serious stenosis of the terminal ileum at the site of the two tumors. The loops of intestine were dilated and showed active peristalsis; the movement of the barium was slow and there were filling defects. In the other case there was extreme stenosis of the terminal ileum. Operation showed tumor of the terminal ileum and histological examination showed that it was inflammatory in nature.—*Audrey G. Morgan.*

Huet, J.-A. La colite segmentaire, signe indirect d'appendicite chronique. (Segmental colitis, an indirect sign of chronic appendicitis.) *Bull. et mém. Soc. de radiol. méd. de France*, March, 1930, *18*, 124–127.

The author expresses the opinion that the roentgen visualization of a segmental colitis is indicative of chronic appendicitis. Twelve cases in which this phenomenon was observed and which were controlled at operation are briefly described.—*T. Leucutia.*

Dinkin, L. Röntgenuntersuchung blutender Affektionen des Magen-Darmkanals mittels einer Wasserstoff superoxyd-Kontrastaufschwemmung. (Roentgen examination of bleeding affections of the gastrointestinal canal by means of a hydrogen peroxide contrast suspension.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, March, 1930, *41*, 446–451.

The following contrast suspension is advised for the visualization of bleeding surfaces of the gastrointestinal tract. Two spoonfuls (75 gm.) of barium are dissolved in 200 gm. of water and 50 to 70 c.c. of a 3 per cent H_2O_2 solution are added; for a barium enema a double amount of the emulsion is taken. The hydrogen peroxide when coming in contact with the bleeding surface forms a foam which helps to localize this site and demonstrate the extent of the lesion. In case of bleeding strictures, these can be accurately estimated due to distention of the bowel above the stricture by the H_2O_2. Several roentgenograms are included and 6 cases are briefly described in order to show the value of the method.—*T. Leucutia.*

GENITOURINARY SYSTEM

Teposu, E., and St. Jianu. Pyelografia intravenoasă. (Intravenous pyelography.) *Cluj. med.*, May, 1930, *11*, 235–237.

The authors have used uroselectan routinely for intravenous pyelography since April, 1930, with satisfactory results. Five cases in which the method was of particular value are described more or less in detail and illustrated with roentgenograms. In one of the cases symptoms of tetany appeared during the second part of the injection, lasting for a period of about ten minutes. Following the intravenous injection of calcium the condition returned to normal. It is the authors' contention that since this patient normally presented a hypocalcemia there was a latent tetany which was activated by the injection. The complication was of no significance.—*T. Leucutia.*

Turano, Luigi. Calcoli migranti dell'uretere. (Migrating calculi of the ureter.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 235–243.

A case is described in which there were two movable calculi in the right ureter. One of these was found on the first examination in the kidney pelvis, but operation did not show anything there. A later examination showed two calculi in the ureter at the level of the third sacral foramen; a still later one showed that one of the calculi had risen into the kidney and another one a few weeks later showed both the calculi in the kidney pelvis. It is not unusual for urinary calculi to move downward but cases in which they move upward are unusual. In this and the other cases described in the literature the ureter was dilated, which explains the upward migration. The case shows that if a kidney stone is diagnosed roentgenologically and not found on operation it may be because it has moved. In such cases the ureter should also be examined roentgenologically and if possible a roentgenogram should be taken immediately before the operation. This reduces the chances of operative failure to a minimum. —*Audrey G. Morgan.*

Bianchini, A. Su di un caso di calcificazione quasi totale delle vie deferenziali. (A case of almost total calcification of the vasa deferentia.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 228–233.

A man of thirty-four came to the author for examination on account of hematuria; he had no other subjective or objective symptoms. The roentgenogram showed almost complete calcification of the vasa deferentia. The patient was not syphilitic and had been well up to the age of nineteen when he had a tuberculous epididymitis followed by the surgical opening of a local cold abscess; he recovered with this and general treatment. He was married thirteen years ago and his wife had an abortion in the fifth month ten years ago and eight years ago a child, now living and well. The author thinks that the tuberculous epididymitis caused the almost total calcification of the vasa deferentia. It seems curious that with such massive calcification of the vasa deferentia he should have been able to procreate. Evidently the obstruction of the vasa deferentia had developed slowly

and had not become complete until in recent years.—*Audrey G. Morgan.*

SKELETAL SYSTEM

LACHAPÈLE. Malformation congénitale bilatérale du scaphoïde carpien (naviculare carpi bipartitum). (Bilateral congenital malformation of the carpal scaphoid (naviculare carpi bipartitum).) *Bull. et mém. Soc. de radiol. méd. de France*, March, 1930, *18*, 162–164.

A bipartition of the scaphoid was observed in a man fifty years of age who came for examination as a result of injury. The first impression was that there was a fracture, but the great interspace and the smooth rounded outline of the fragments suggested the possibility of a congenital anomaly. A roentgenogram of the other hand was then taken and this revealed a similar condition of the opposite scaphoid, thus confirming the diagnosis of congenital anomaly (bilateral bipartition of the scaphoid).

The case is interesting from a legal standpoint since it shows that a condition simulating a fracture may occur on a congenital basis. A control examination of the opposite side is of great advantage.—*T. Leucutia.*

TEMEL, TARIK. Sur un cas rare de malformation congénitale de la main. (A rare case of congenital malformation of the hand.) *Bull. et mém. Soc. de radiol. méd. de France*, March, 1930, *18*, 109–111.

The author describes a case of congenital macrodactylia of the thumb, index finger and third finger of the right hand. The measurements of the fingers were as follows: thumb 18 cm. long and 16 cm. circumference; index finger, 35 cm. long and 35 cm. circumference; third finger, 28 cm. long and 21 cm. circumference. All the bones of the affected fingers were enlarged, the second metacarpals being especially involved.—*T. Leucutia.*

NICOTRA, A. Omero varo. (Humerus varus.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 79–80.

The author has seen 3 cases of humerus varus, one in a normal adolescent, one in a cretin and one in a subject with achondroplasia. The humerus varus of adolescents is not the same as the form seen in dystrophy of the skeleton in microcephalics, cretins, rachitics and acondroplasics. In the latter the curvature of the humerus is only an episode in the multiple deformities of the skeleton seen in these subjects. The humerus varus of adolescents is produced by breaking down of the wall of a monolocular cyst of the metaphysis. The inflammatory humerus varus described by some authors is an ordinary varus secondary to an osteomyelitis and is entirely secondary in importance to the osteomyelitis. In some cases the osteomyelitis may have developed in a solitary cyst of the metaphysis.—*Audrey G. Morgan.*

ARNONE, G. Biotipo scheletrico. (Biotypy of the skeleton.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 123.

The author reports some clinical cases and concludes that the skeleton must be considered a system of autonomous correlations which from the moment of conception, from characters fixed in the germ cell, takes on a special imprint, which in his cases could be demonstrated roentgenologically, so that the skeleton has a well-defined physico-chemico-biological consitution. This primary stamp is one of the constitutional factors which determine the evolution and pathology of the skeleton. This is very different from the ordinary conception of roentgenologists who consider the skeleton only a sustaining tissue that adapts itself to the requirements of the organs. This autonomy begins in intrauterine life and as a result of a defect of development in its layer the skeleton may show abnormalities of development entirely independent of the other organs.—*Audrey G. Morgan.*

JANKER, ROBERT. Die Epiphysen der Wirbelkörper und ihre Veränderungen; "persistierende Wirbelkörperepiphysen." (The epiphyses of the vertebral bodies and their changes; "persisting epiphyses of the vertebral bodies.") *Fortschr. a. d. Geb. d. Röntgenstrahlen*, April, 1930, *41*, 597–606.

The vertebral epiphyses appear at the age of from eleven to thirteen in the form of triangular shadows at the upper and lower margins of the bodies of the vertebrae, complete ossification occurring at the age of twenty-four.

The changes observed in connection with abnormal ossification of the epiphyses are: (1) osteochondritis deformans juvenilis dorsi, and (2) the so-called "persisting epiphyses of the vertebral bodies." This latter condition is characterized roentgenologically by the presence of small triangular shadows at the upper

and lower margins of the vertebral bodies, best visualized in the lateral view, completing the usual rectangular form of the bodies of the vertebrae affected. Differential diagnosis includes bone splinters, arthritic changes and abnormal calcifications of the intervertebral discs.

The author describes briefly 7 cases of "persisting epiphyses of the vertebral bodies" which he has observed during the past few years in a series of 750 spinal examinations.—*T. Leucutia.*

Bean, Harold C. Tuberculosis of the symphysis pubis. *J. Bone & Joint Surg.*, April, 1930, *12*, 345–352.

The author reports a case of tuberculosis of the symphysis pubis. He reviews the literature, and concludes from his analysis of the reported cases that tuberculosis may appear in the symphysis pubis at any stage of life, that sex does not have any bearing on its occurrence, that two rather constant findings occur, an irregular gait and a tumor mass. This mass may appear in the upper thigh or be localized about the symphysis. When a fistula appears the diagnosis is rather easy.

In his case report he gives no illustration of the roentgenogram of the lesion which he describes as a definite destructive lesion in the left symphysis. It was impossible to say whether this was due to osteitis fibrosa with a cyst or to tuberculous disease. His experience in this case leads him to say that in all cases of sacroiliac lesion, inguinal pain, lower abdominal and upper thigh tenderness, roentgenograms of the symphysis pubis should be included in the examination before treatment is considered; that in cases where there are acute symptoms, curettage should be instituted, with fixation when the wounds are healed.—*R. S. Bromer.*

Hellner, Hans. Spondylolisthesis, traumatische Sub- bzw. Totalluxation in der Lumbosakralregion und sogenannte Präspondylolisthesis. (Spondylolisthesis, traumatic sub- and total luxation in the lumbosacral region and so-called prespondylolisthesis.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, April, 1930, *41*, 527–549.

On the basis of a review of the literature as well as of several of his own cases, the author makes the following distinctions between the various lesions of the lumbosacral region: (1) The term spondylolisthesis should be applied only to cases on a congenital basis. The traumatic sub- and total luxations must be separated from spondylolisthesis for the following reasons: (*a*) a subluxation never leads to a complete slipping of the vertebrae; (*b*) spondylolisthesis contrary to traumatic subluxation, is presumably congenital and (*c*) it does not imply the presence of trauma as an etiologic factor. Traumatic subluxations are more frequent than congenital spondylolisthesis. The American literature includes both conditions under the term of spondylolisthesis, although their separation is important also from a medicolegal standpoint.

(2) The subluxation of a vertebra due to tuberculosis, tabes, and spondylitis deformans, should not be included within the spondylolisthetic group for the simple reason that here the destruction of an intervertebral disc is the primary provoking factor.

(3) A lumbosacral angulation which is smaller than 120° (determined by Junghann's procedure) may produce sacral pain.

Lumbosacral lordosis with normal or slightly increased inclination of the pelvis and without functional disturbance often occurs on a constitutional basis. Here the lumbosacral angle is likewise smaller and there is nearly horizontal position of the sacral bone, resulting in the so-called pointed sacrum of Scherb. This condition does not represent a preliminary stage of spondylolisthesis and consequently its designation as pre-spondylolisthesis should be abandoned.

The changes in the lumbosacral region can thus be briefly classified as follows: (*a*) spondylolisthesis on a congenital basis; (*b*) traumatic sub- and total luxations on a traumatic basis, and (*c*) increased lumbosacral lordosis (among them chiefly the pointed sacrum of Scherb) on a constitutional basis.—*T. Leucutia.*

Schmorl, Georg. Die Pathogenese der juvenilen Kyphose. (The pathogenesis of juvenile kyphosis.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, March, 1930, *41*, 359–383.

Juvenile kyphosis is the result of a hemispherical protrusion of the nucleus pulposus into the spongiosa of the bodies of the vertebrae occurring chiefly in the mid- or lower dorsal region.

The primary cause is most probably a splitting of the cartilaginous plates (due to traumatic injury or congenital anomalies). Later an endochondral growth of the cartilaginous

plates develops leading, because of the functional disturbance, to a kyphosis of the spine. If the person affected must perform heavy labor during the second period of growth, the kyphosis may become very pronounced, whereas if the stress on the intervertebral discs is less, the kyphosis may be only moderate or entirely absent.

The changes of the juvenile kyphosis are so characteristic that a differential diagnosis from other forms of kyphosis (rickets, osteomalacia, osteoporosis, trauma, infection) as a rule does not encounter great difficulties. Moreover, because of the rather permanent nature of the changes produced, the juvenile origin of the kyphosis can be recognized even in later life.

The article is illustrated with numerous photographs and roentgenograms of anatomic sections and with several interesting photomicrographs.—*T. Leucutia.*

Calvé, Jacques, and Galland, Marcel. Le nucleus pulposus intervertébral; son anatomie, sa physiologie, sa pathologie. (The intervertebral nucleus pulposus; its anatomy, physiology and pathology.) *Presse méd.*, Apr. 16, 1930, *38*, 520–524.

A. Anatomy. The intervertebral disc consists of the nucleus pulposus and annulus fibrosus and of the superior and inferior cartilaginous plates. The nucleus pulposus is situated in the center, or more frequently at the margin of the middle and posterior thirds of the intervertebral disc.

B. Physiology. The nucleus pulposus which is under pressure acts as a spring pushing one vertebra away from the other. In addition to this, it is a shock absorber acting as a veritable ball bearing.

C. Pathology. In this group are included not only the primary lesions of the disc but all those in which the nucleus pulposus has a particular rôle. They are: (1) Calcification of the nucleus, which is exceedingly rare, and is characterized on the roentgenograms by a homogeneous oval shadow corresponding to the site of the nucleus pulposus. Its clinical significance is not as yet clear. (2) The posterior displacement of the nucleus (Galland). (*a*) This often occurs secondarily in developmental anomalies of one of the vertebrae (absence of ossification of the anterior epiphysis). The adjacent superior and inferior vertebral segments incline on the affected vertebra, thus leading to posterior displacement of the nucleus pulposus with subsequent kyphosis. The diseased vertebra forms the peak of the kyphotic curvature. (*b*) In other instances, the posterior displacement of the nucleus is primary, as for example in the cases in which there is an increased posterior protrusion of the vertebral segments (especially in the dorsolumbar and upper lumbar regions) pressing on the spinal cord. Clinically this condition is characterized by localized kyphosis and paraplegia. (3) The bowl-shaped discs (usually associated with osteoporosis) consisting in a peculiar spherical or ovoid enlargement of the intervertebral discs with corresponding decrease in the size of the vertebral bodies (typical biconcave lenticular aspect). This condition is observed in post-puerperal malacias, in children with generalized osteomalacia, in hunger osteomalacias (in Germany shortly after the war) and in certain localized osteoporoses (of neoplastic or Paget origin). (4) The intraspongious nuclear hernias, studied in detail by Schmorl. There is a protrusion, usually symmetrical, of the nucleus pulposus into the spongiosa of the adjacent vertebrae, forming veritable hernias of various size and form (strawberry, raspberry, creeping caterpillar). The condition occurs in 38 per cent of all the examined spines. The chief lesions leading to intraspongious hernias are: (*a*) the painful kyphosis of adolescence (between fourteen and eighteen years) which occurs chiefly in the mid-dorsal region; (*b*) the kyphosis with indented discs, the so-called epiphysitis (although the author is of the opinion that the term epiphysitis should be reserved for designation of those lesions in which the intervertebral disc is of normal appearance and the lesion is confined only to the site of the epiphysis), and (*c*) other kyphoses with a roentgen appearance similar to that of the kyphosis with indented discs but of a more complex character. The nature of these latter has not as yet been sufficiently studied.

There is no doubt that the pathology of the intervertebral discs plays a very important part in the pathology of the spinal column as a whole.—*T. Leucutia.*

Turano, Luigi. Di un aspetto radiografico raro di vertebra dorsale. (An unusual appearance of a dorsal vertebra.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 75–79.

An examination of the urinary tract was made in a woman of thirty-five. The pictures did not show anything abnormal there but the

roentgen picture showed a peculiar striation of the 12th dorsal vertebra, the stripes running both up and down and across so as to form a network with large meshes. The form of the vertebra was normal and there was nothing abnormal in the other vertebrae. There were no symptoms referable to the spinal column and sensation and motion were normal. The cause of this peculiar appearance is not known. It may have been a congenital bone lesion. There was a moderate degree of scoliosis with the concavity to the right.—*Audrey G. Morgan.*

Nicotra, A. Di una bandaletta ossea sacro-lombare anomala in casi di sacralizzazione della ventiquattresima vertebra. (An anomalous sacrolumbar band of bone in cases of sacralization of the 24th vertebra.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 81–93.

Two cases are described, the first in a man of fifty-eight who from time to time had lumbosciatic pain with irradiation along the branches of the sciatic on both sides. Sometimes the pain was almost unendurable and prevented walking. The roentgenogram showed an extreme degree of sacralization of the fifth lumbar and diffuse osteoarthritis of all the lumbo-sacro-iliac tract. There were two bands of bone, one on each side, connecting the fifth lumbar with the sacrum. Above, the bands were implanted on the posterior surface of the costiform process of the fifth lumbar at the site of the accessory tubercle; below, on a spine at the posterior margin of the wing of the sacrum, on the prolongation of the crest of the conjugate tubercle. The intervertebral space between the costiform process of the fifth lumbar and the sacrum had disappeared. There were two supernumerary sacral foramina.

The second patient was a woman of fifty-nine who had had chronic dorsal and lumbar arthritis for many years which radiated to the gluteal region and along the branches of the sciatic and interfered with walking. The roentgen examination showed a high degree of bilateral sacralization of the fifth lumbar with signs of diffuse osteoarthritis of all the lumbosacral tract. In this case there was a band of bone, similar to those in the above case, but only on the right side.

These bands are always seen in a high degree of sacralization of the fifth lumbar, though the bands are not themselves necessarily bilateral. In some cases only the upper part of the band is visible. These bands are commonly said to be due to calcification of ligaments but the author shows by a discussion of the anatomical position of the ligaments that this cannot be so. He thinks that the upper part of the band comes from a unilateral or bilateral styloid process and the lower part from the upper half of the conjugate tubercle of the sacrum. The bands therefore are homologous morphogenetically with the conjugate tubercle of the sacrum.—*Audrey G. Morgan.*

Francesco, G. Contributo clinico-radiologico alle spondiliti infettive. (Clinical and roentgen study of infectious spondylitis.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 94–111.

Four cases are described with illustrative roentgenograms. The patients were thirty-five or more years of age. *Staphylococcus pyogenes aureus* is almost always the cause, more rarely *pyogenes albus*, very rarely the streptococcus. The disease begins suddenly and violently, and its course is long and serious. The septic focus in the spinal column may be primary, in which case pain in the spinal column with spasm of the cervico-dorso-lumbar muscles and the rigidity of the spinal column, which may extend to opisthotonos, suggest meningitis. If the focus in the spinal column is secondary there may be a longer or shorter course with fever of a septicemic type that suggests typhoid. Lumbar puncture will help to clear up the diagnosis. In the septicemic cases the diagnosis cannot be made until there are some spinal symptoms. If the defensive forces of the body are good there may be periods of improvement or apparent cure but the attacks will recur.

Roentgen examination in the period of defervescence shows beginning changes in the bones. The outlines of the bodies of the vertebrae are not distinct, they are less opaque than usual, the intervertebral discs thinner and the lateral projection of the bodies of the vertebrae shows slight thickening due to periosteal reaction. As the disease progresses the changes extend to more vertebrae, the periosteal reaction increases, the bodies of the vertebrae become more transparent and the outline more indistinct. The ones on which there is the most pressure become deformed. Osteoid processes form between the bodies of the vertebrae which finally unite and form a bony bridge. These bridges extend laterally and gradually form a cuff around the intervertebral disc. The intervertebral discs thin out until finally the bodies of the two adjacent vertebrae fuse with each

other. The vertebrae that are the most affected show the greatest decalcification. Later they become more opaque, the bone structure can no longer be recognized and they become eburnated and disc-shaped. There may be transparent areas with true sequestra alternating with areas of increased density.

From a discussion of the details of the pictures in his cases the author finds that there are three types of the disease: in the first type the bodies of the vertebrae and the intervertebral discs are affected and the organism reacts producing a sustaining cuff which helps to immobilize the column. In the second type there are multiple accessory formations along the affected segment of the cord. The third type is purely destructive with little or no reaction on the part of the organism.—*Audrey G. Morgan.*

MIRTO, DOMENICO. Rapporti fra rachischisi ed impotenza funzionale virile. (Relation between spina bifida and male impotence.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 112–115.

Piccinino was the first to find spina bifida occulta on roentgen examination in a surprisingly large number of patients with enuresis and he thinks spina bifida is the cause of the form of male impotence manifested by incomplete and precocious ejaculation. He reports that in 21 cases of this form of impotence there was spina bifida in all, generally of the 1st sacral vertebra, in a few cases of the 5th lumbar or even the 4th or 3d. And he also claims that in all cases of functional impotence examined there was spina bifida.

The author therefore examined a series of cases to see if these findings could be verified. He found that there can be functional male impotence without spina bifida and spina bifida without impotence, so the finding is by no means pathognomonic. Of course forms of functional impotence due to dyscrasia, the toxic forms and those due to general neurasthenia and psychoasthenia have nothing to do with spina bifida.—*Audrey G. Morgan.*

AIRALE. Osteoma della colonna vertebrale lombare e consecutiva idronefrosi per compressione dell'uretere. (Osteoma of the spinal column followed by hydronephrosis from compression of the ureter.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 123–124.

A young syphilitic after a trauma of the spinal column about two years ago, showed two superimposed shadows in the costoiliac region on the right. One was very intense and irregularly circular; it reached from the last rib to a little above the outline of the ilium and had a peduncle which extended to the bodies of the 2d and 3d lumbar vertebrae; above this shadow there was another less intense one ovoid in form which extended beyond the first one both above and below. The first one was sharply circumscribed and was of the same density as the flat bones; inside it there was stratification and trabeculation like that of spongy bone; the second was uniform and less intense. It was a pedunculated osteoma of the 2d and 3d lumbar vertebrae. Such tumors are not rare in syphilitics but they are not usually as large as this one. The tumor had compressed the ureter and caused hydronephrosis and the kidney was greatly enlarged.—*Audrey G. Morgan.*

COLA. Sopra un caso di endotelioma della tibia. (A case of endothelioma of the tibia.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 124–125.

A woman, aged fifty-six, with a history of tuberculosis had for over a year complained of violent pain which came on suddenly in the upper third of the right leg. The leg was slightly red and swollen, hot to the touch and painful on pressure. The limb was not deformed and the joints were free. Roentgen examination of the epiphysis of the tibia showed a rounded transparent area the size of a chestnut, surrounded by a double opaque ring, with sclerosis of the surrounding bone and slight periosteal reaction. As diagnosis could not be made directly from the finding it had to be made by exclusion. The clinical diagnosis of osteomyelitis made by the surgeon was excluded by the roentgen characteristics of the focus and particularly the absence of any rarefying osteitis. The negative Wassermann reaction and the lack of any benefit from specific treatment excluded syphilis. The theory of mycosis, especially sporotrichosis, was excluded by the negative Widal-Abrami reaction and the lack of effect of an iodide treatment, which is specific in this disease. Operation showed a cavity with irregular walls containing a small amount of turbid liquid. Cultures of the liquid in agar and broth were sterile. Histological examination of fragments showed that it was an endothelioma and this diagnosis was confirmed by the numerous metastases that developed in the course of a year.—*Audrey G. Morgan.*

Milani, Eugenio. Su di un caso di osteosi eburneizzante monomelica. (A case of eburnated osteosis of one limb.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 70–74.

A case is described in a boy eleven years of age. He was sent to an institution for heliotherapy with a diagnosis of tuberculous coxitis. He began to have pain in the right leg in the latter part of 1926; it increased and he had spasms of pain that were so intense that he could not walk; there was limitation of movement of the right coxofemoral joint and the limb was in slight abduction. When he was examined in October, 1927, it was hard for him to walk; he limped and dragged his leg. There was no pain in the hip and no muscle atrophy. The movements of the coxofemoral joint were limited, expecially abduction, which was painful. On roentgen examination the coxofemoral joint appeared to be intact; there was an ivory-like thickening of the internal part of the femur in the shape of a vertical stripe that was narrow above the lesser trochanter, widened a little toward the middle part of the diaphysis and then became narrower again. The Wassermann reaction was negative. Chronic osteomyelitis seemed to the author to be the most probable diagnosis as the lesion seemed to be limited to the diaphysis of the femur and was accompanied by marked functional disturbance. The patient was given heliotherapy in the summer of 1928, and improved so much that in January, 1929, he was sent back for roentgen examination again by his physician to prove that the diagnosis of tuberculous coxitis had really been the right one. The patient had some pain in the ankle; the functional disturbance of the hip was not cured but only improved so that he could walk with less difficulty. In addition to the previous stripe of eburnation roentgen examination showed a dense stripe on the proximal end of the tibia and on the upper third of the inner side and a spot of density on the astragalus. There is little doubt of the diagnosis of eburnated osteosis though the lesion was slight in extent. The author has not seen the patient since.

The case is interesting because of its course and its possible relation to the form of chronic osteomyelitis of unknown origin described by Sicard and Ragueneau; in their case the density was limited to one-half of one lumbar vertebra and the sacroiliac joint on that side. The fact that in the author's case there was at first density only on the inner side of the femur and later other dense areas appeared in other parts of the limb suggests that it would have been interesting to follow up the case of Sicard and Ragueneau.—*Audrey G. Morgan.*

D'Istria, Antonio. Un caso di discondroplasia. (A case of dyschondroplasia.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 116–122.

A man of forty-four was sent for roentgen examination of the thorax for suspected bronchial catarrh. His arms were unusually short; the tips of the fingers reached barely to the crests of the ilium. He said that ever since he was eight or ten years old his arms had been shorter than those of his brothers and sisters. There was no family history of such a malformation. The forearms were curved with the convexity inward and dorsally. Nothing unusual in the hands.

Roentgen examination of the humerus showed that the upper metaphysis was key-shaped with swelling of the inner border, while the outer one was normal except for some small exostoses. The bone at the level of the swelling showed some clear areas and some strips of increased density. The upper ends of the two ulnas seemed to be enlarged but normal in shape. The head of the left radius did not articulate with the condyle of the humerus, but on the external side there was a small projecting beak without any joint surface. The neck was abnormally long. On the right the head of the radius, which had a long neck, reached more than a centimeter above the joint line and the bicipital tuberosity was at the level where the head normally is. The condyle of the humerus at this joint was rudimentary; the head of the radius had no articulation with it. While at the proximal ends of the forearms there was a disturbance of growth of the radii, at the distal end the ulnas seemed to be most seriously affected. On the right the diaphysis of the ulna was concave forward and outward; at the union of the lower and middle thirds there was a small marginal exostosis; the lower end at the wrist was irregularly rounded; there was no trace of a styloid process and no epiphysis seemed to have been formed. The lower end of the ulna was about 1 cm. from the upper border of the pyramidal bone with which it should articulate. The diaphysis of the radius was S-shaped with the concavity backward in

the upper part and in the direction of the palm in the lower part. There were two small exostoses on the lower third running toward the palm. The lower epiphysis seemed to be abnormally elongated so that the joint surface was much more oblique inward than usual. On the left the lower end of the ulna was about 2 cm. from the upper margin of the pyramidal. A little above this there was a rounded tubercle that seemed to articulate with a corresponding excavation in the radius. It would seem that in the period of growth exostoses had developed at this level on the ulna and radius and that their form had become adapted to the necessities of pronation and supination, forming a true articulation. The radius was also thicker than that of the opposite side and its joint surface was more inclined inward. There were no abnormalities in the bones of the hands except some very small exostoses at the bases of the first phalanges of the ring and middle fingers on the left side. In the legs there were symmetrical exostoses on the inner borders of both tibias and vacuoles of various sizes surrounded by rings of increased density; there were almost symmetrical chondromata on the upper and lower epiphyses of both fibulas.

While the legs in this case showed the classical lesions of dyschondroplasia those in the arms were not like the ordinary picture. The key-shaped deformity of the inner border of the humeri was evidently the result of ossification of old enchondromata or else of simple excessive growth of bone. The deformities of the radius also seemed to be due to excessive growth, while those of the ulna were due to defective growth. This case is interesting because of its complexity and because it may help in defining the picture of dyschondroplasia more accurately.—*Audrey G. Morgan.*

LERICHE, R., and FONTAINE, R. Des ostéoporoses douloureuses post-traumatiques. (Painful post-traumatic osteoporoses.) *Presse méd.*, May 7, 1930, *38*, 617–622.

The purpose of this article is to call attention to the surprising effect of sympathectomies on the osteoporoses resulting from certain injuries, as for example violent traumas without fracture, repeated traumas without the history of a clinical accident, obscure fractures (of the scaphoid, lower extremity of the radius, fibula, etc.) and finally certain operative procedures (removal of ingrown nail, astragalectomy, articular operations, etc.). As is known, the osteoporosis in all these instances is often associated with severe clinical symptoms consisting chiefly in pain and limitation of function.

The authors have performed periarterial sympathectomy in 16 cases of osteoporosis of the above group, with surprising results. The pain has disappeared within a few hours, and the function has greatly improved or returned to normal within a few days following the operation. The roentgenograms of the bones revealed a rapid disappearance of the osteoporosis with return to normal within a few months.

The site of the sympathectomy was on the humeral artery in case of lesions of the wrist, on the subclavicular artery (prescalenic segment), or bicervico-scapular trunk in case of osteoporosis of the shoulder, on the superficial femoral artery in case of lesions of the ankle and on the external iliac (just above the crural arch) in case of osteoporosis of the knee.

The 16 cases are briefly described and illustrated with numerous pre- and postoperative roentgenograms and photographs showing remarkable functional improvement.—*T. Leucutia.*

BUONAMICI, C. BANCI. L'osteoperiostite ipertrofica pneumonica (Mor bo di Marie). (Hypertrophic pulmonary osteoperiostitis (Marie's disease).) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 21–52.

The author describes a case in a man aged thirty-eight. In September, 1927, he began to notice that this hands were growing larger; the ends of the fingers enlarged and the nails became curved. The same changes took place in the feet. At the same time he began to have pains in his limbs, particularly when fatigued, chiefly in the knee and wrist joints and the malleoli. During the winter of 1926 he had had fever and pain in the right half of the thorax with a purulent fetid sputum. During the winter of 1928 he had cough and copious mucopurulent sputum. In July, 1928, he came to the hospital as the cough and copious sputum continued. On admission he had cough, no pain in the thorax. Percussion showed the lungs normal except for a small dull zone at the base of the right lung. Auscultation showed many large and medium-sized râles. The muscles of the limbs were slightly hypertrophied. Roentgen examination showed changes in the long bones. The bones of the skull and face were normal; the sella turcica was normal.

The ends of the long bones of the limbs and of the phalanges were enlarged, partly due to over-development of the spongy tissue but largely to thickening of the cortex from proliferation on the part of the periosteum.

Though the patient had a history of syphilis the author thinks this was a case of true Marie's disease which he calls pulmonary because it is generally seen in association, as in this case, with a chronic purulent disease of the pleura and lungs. It may be caused by other diseases however. There is also a nervous and constitutional factor in the disease. It is not hereditary but is secondary to toxic-infectious conditions. It should be differentiated from simple hippocratic fingers, which are seen in many diseases. In simple hippocratic fingers the changes are chiefly in the soft parts; the bones are not changed and there is no pain or functional impotence; its development is progressive and continuous. In Marie's disease there are changes in the bones and periosteum not only of the phalanges but also in other bones, with pain and functional weakness. The pain in the bones and joints is not continuous but in attacks. The diagnosis must be made by roentgen examination of the bones.—*Audrey G. Morgan.*

Mathey-Cornat. Étude radiographique de quelques cas d'ostéopathie déformante du type Paget. Tumeurs des os chez les Pagétiques. (Roentgen study of some cases of deforming osteopathy of the type of Paget; bone tumors in Paget's disease.) *Bull. et mém. Soc. de radiol. méd. de France*, March, 1930, *18*, 159–162.

The author observed the occurrence of bone tumors in 2 cases of Paget's disease of long duration. In the first case, that of a man forty-four years of age (the Paget's disease lasting for fourteen years), an osteogenic sarcoma of the scapula developed, which terminated fatally within six months. In the second case, that of a man fifty-three years of age, the Paget's disease was associated with an osteochondroma of the ilium which was observed for a period of over four years. In this latter case the diagnosis was not confirmed by microscopic section.—*T. Leucutia.*

Zadek, Isadore. Complicated traumatic dislocation of the hip. *J. Bone & Joint Surg.*, April, 1930, *12*, 419–428.

Zadek states that traumatic dislocation of the hip is a lesion of infrequent occurrence. Its presence should be suspected when the hip is held fixed in a distorted attitude following a severe injury. Three cases of traumatic dislocation of the hip are reported. One was first seen by the author six weeks after the injury; the second, nine weeks after the injury and the third case on the day after the injury. The third case was complicated by a fracture of the shaft of the femur as well as a fracture of the head of the femur. The injury to the shaft of the bone completely overshadowed the hip lesion which had not been recognized.

It is possible to reduce these old dislocations weeks after their occurrence. One of the posterior variety was reduced by the closed method six weeks after the injury. Another (obturator) was reduced by open operation ten weeks after its occurrence. The ages of these patients were in the twentieth to the fortieth year limit, which as Baetjer has observed, is roughly the common age incidence. At an earlier and later period, fracture of the neck of the femur is most likely to occur.

Cases of this sort should be recognized early as the result of reduction of the old cases compares most unfavorably with the recent ones, particularly because of the subsequent occurrence of an osteoarthritis. One of Zadek's patients showed a leucocytosis and an increase in polymorphonuclear leucocytes from a considerable hemorrhage into the tissues. No other source or cause for this leucocytosis could be found.

The paper is illustrated with roentgenograms of the cases both before and after the operations for reduction, and also in one case eighteen months after the operation, which shows a marked osteoarthritis of the hip joint. —*R. S. Bromer.*

Roberts, Percy W. An unusual congenital anomaly of the bones of the leg. *J. Bone & Joint Surg.*, April, 1930, *12*, 414–415.

Roberts reports a case of a child of seven years of age, born with a moderate equinovarus. The affected extremity was 2½ inches shorter than the normal, and clinically it showed what appeared to be a lateral deflection of the lower end of the fibula, suggestive of an old fracture. The roentgen examination showed a most unusual condition. The fibula, beginning at the junction of the lower and middle thirds, was flared out, not unlike a normal tibia, and the lower half of the tibia was tapered without any evidence of a malleolar expansion.

The ankle joint was formed by the articulation of the lower end of the fibula with a misshapen astragalus. Roentgenograms made at the age of seven months showed the malformations in their early stages.

While the shortening could in some degree be accounted for by a fracture of the fibula which occurred during a manipulation of the foot, made at an early age to correct the equinovarus, there is no doubt that it is chiefly due to congenital disturbance in the centers of growth as indicated in the roentgenograms made in the first few months of life. This observation is of interest in venturing a prognosis in similar cases.—*R. S. Bromer.*

Böhm, Max. The development of juvenile pes valgus. *J. Bone & Joint Surg.*, April, 1930, *12*, 333–344.

This article is based on material presented by the author at the Congress of the German Orthopedic Society. In his orthopedic clinic a great number of "valgus deformities" of the foot are classed under the generic name "flat foot." Hoffa attempted to clear up this rather confusing classification. He differentiated clearly between true flat foot in which the arch is flattened out, and the pes valgus which appeared to be an outward twist of the medial malleolus. This may persist or it may go on to the formation of a true flat foot by the secondary depression of the arch. The pes valgus as described by Hoffa appears at puberty as a "static" pes valgus, and he thought that continual weight-bearing on the feet was responsible for the deformity.

Böhm believes that cases which one might term secondary should be separated from pes valgus. These are the result of trauma, such as fractures, or bone disease and joint affections, paralysis, etc. In addition to this group is a second, the rachitic. Rickets sometimes produces an outward bending of the leg resulting in a varus deformity. A third group is the purely compensatory pes valgus which develops in connection with varus deformities of the lower extremities due to various causes.

If these three groups are separated the true idiopathic pes valgus remains. This is more noticeable at puberty than at any other time. Böhm analyzes the clinical picture in detail and feels that an assumption that a developmental anomaly is the important factor in the etiology of the condition is justified. He then reviews the normal development of the ankle joint, and reports the roentgen studies of his cases. In many patients he found that the medial malleolus was more prominent than it should be at the age of puberty. The tibial joint surface as defined in the roentgenogram runs obliquely from the medial below to the lateral above, the epiphysis, therefore, being considerably decreased in size toward the lateral side. The roentgen study thus discloses an anatomic condition similar to that which he demonstrates in the embryonic and infantile foot. This analogy suggests the conclusion that idiopathic pes valgus is the clinical manifestation of a developmental arrest. This conclusion is supported by the fact that the deformity shows a very definite hereditary and familial selectivity.

To rule out the possibility that the wedge-shaped distal tibial epiphysis might be a secondary condition, a mechanical deformity resulting from abduction of the foot caused by other factors, Böhm made a roentgen study of such cases and found that the typical wedging of the distal epiphysis of the tibia was lacking.

As a result of his studies he feels that pes valgus idiopathicus is the result of a faulty development. With this abnormal condition, the plastic material of the growing bones of the foot is defective and static forces during development can progressively exaggerate the deformity.—*R. S. Bromer.*

Aubertin, Ch., Thoyer-Rozat., and Lévy, Robert. La radiothérapie de la maladie de Hodgkin (lymphogranulomatose maligne). (Radiotherapy of Hodgkin's disease (malignant lymphogranulomatosis.).) *J. de radiol. et d'électrol.*, March, 1930, *14*, 145–157.

After a detailed description of the symptomatology, evolution, clinical forms, and diagnostic procedures of Hogkin's disease, the authors discuss the various radiotherapeutic procedures such as roentgen therapy, curie therapy, and the subcutaneous injection of thorium X.

The article constitutes a summary of the present methods of radiation therapy in Hodgkin's disease.—*T. Leucutia.*

Gauducheau, R., Brillouet and Lévesque. Trois cas de sarcomes lymphoblastiques de l'amygdale et de la région carotidienne inférieure. (Three cases of lymphoblastic sarcoma of the tonsil and inferior carotid region.) *J. de radiol. et d'électrol.*, March, 1930, *14*, 177–181.

In October, 1928, the authors published 5 cases of lymphoblastic sarcoma of the nasopharynx of which 3 have died and 2 have remained well (following deep roentgen therapy) for a period of $4\frac{1}{2}$ and $2\frac{1}{2}$ years respectively. In the present article 3 new cases are added, one of which was cured by deep roentgen therapy. The 3 cases are described in detail. The conclusion is reached that in lymphocytoma or lymphoblastic sarcoma roentgen therapy with penetrating rays is the method of choice and that surgical interventions are not only useless but directly contraindicated. In case of biopsy it is wise to administer preliminary irradiation over the gland or tumor to be removed.—*T. Leucutia.*

Gargiulo, Mario. Trattamento Rontgen di pterigio recidivante degenerato. (Roentgen treatment of degenerative recurrent pterygium.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 250–252.

A patient blind in the right eye from juvenile trauma was operated on in 1915 for internal progressive recurrent pterygium of the periphery of the pupillary disc of the cornea. It recurred and he was operated on again in 1923; he came back in 1928 for great decrease of vision. Examination showed that more than half the internal part of the cornea had lost its transparency and normal structure and was replaced by a grayish-white tissue; there was a distinct line of demarcation between the opaque and the transparent part. The grayish-white tissue extended a little distance onto the internal bulbar conjunctiva. The diagnosis was degenerative pannus of the cornea of the type described by Baas. The infiltration in this case was made up of round cells and blood vessels and was situated between the epithelium and Bowman's membrane.

The patient was advised to take roentgen treatment before trying operation. The object was to stimulate the defensive powers of the organism against the young new-formed tissue. He was irradiated using a focus skin distance of 23 cm., a spark gap of 35 cm., 2 ma., filter 0.5 mm. zinc and 3 mm. aluminum, $\frac{1}{4}$ skin erythema dose. This was repeated four times at intervals of 20 days. The opaque tissue covering the cornea disappeared and vision improved. There were no signs of irritation during the treatment. The patient has been under observation a month since the treatment and there has been no aggravation.—*Audrey G. Morgan.*

Piccinino, G. Sul meccanismo di azione della roentgenterapia nella paralisi infantile. (Mechanism of action of roentgen therapy in infantile paralysis.) *Arch. di radiol.*, Jan.–Feb., 1930, *6*, 243–245.

A case is described in a child twelve months of age who two months before had had quite a serious case of poliomyelitis resulting in complete flaccid paralysis of the upper and lower limbs. The treatment was begun by giving two-thirds of an erythema dose at a distance of 30 cm. over the lumbar region, in the course of six days. The patient was to be brought back in two weeks for irradiation of the cervical region but did not return for two months. There was marked improvement limited to the lower limbs. Electrical examination showed partial reaction of degeneration in some muscle groups while normal electrical reaction was restored in some. The same dose was then given over the cervical region; when the patient was brought back after two months there was great improvement in the movement of the arms, particularly the right one. There was still partial reaction of degeneration in some muscle groups.

This shows the value of roentgen treatment in infantile paralysis. This cannot have been a case of spontaneous regression as each time the improvement was only in the region treated. The treatment is more successful the earlier it is given in the paralysis and is not successful at all if not given until after there is complete degeneration of the nerve cells.—*Audrey G. Morgan.*

Westermark, Nils. The result of the combined surgical and radiological treatment of cancer mammae at Radiumhemmet 1921–1923. *Acta radiol.*, Apr. 30, 1930, *11*, 1–32.

This article covers all the cases of cancer of the breast, 307 in all, that applied for treatment at the Radium Institute for the years 1921–1923. Of these 52 cases were not treated; 162 cases have been given combined surgical and radiological treatment. Of these 162 cases 75 have had postoperative radiological treatment, 45 have had radiological treatment before as well as after the operation and in 42 cases the radiological treatment has been combined with removal of the tumor by electro-endothermy. Twenty-two cases of primary

cancer have been given only radiological treatment. The remaining cases showed signs of recurrence or metastasis on admission and have been treated radiologically. All the cases but 2 have been examined several times a year until their death, or in the cases in which the patients are still alive, until the end of 1928.

To give an idea of the value of the radiological treatment the author compares the results obtained at the Radium Institute with those obtained by surgical treatment of cancer of the breast in Sweden. The results of this comparison of cases treated only surgically and those given combined surgical and radiotherapy are as follows: There was five-year freedom from symptoms in a relatively larger number of the cases given combined surgical and radiological treatment. The surgical statistics in Sweden show a five-year freedom from symptoms in 16.8 to 25.5 per cent of the cases. The cases given radiotherapy after operation show a corresponding freedom from symptoms in 29.3 per cent, those treated preoperatively in 40 per cent. The cases treated by endothermia, which in this series were much more serious in nature, showed freedom from symptoms in 28.6 per cent. The recurrences and metastases given radiotherapy showed freedom from symptoms in 9.8 per cent of the cases after more than five years.

The interval before any signs of local recurrence appear after the combined treatment is about the same as after surgical treatment. But there is a much longer interval before distant metastases become manifest in cases treated with radiation and surgery than in those treated with surgery alone. The local recurrences occur much less frequently after the combined treatment than after surgical treatment alone. After surgical treatment 55.7 per cent of the recurrences are local in nature. The postoperative group shows 48 per cent local recurrences, the preoperative group 29.2 per cent and the endothermic group 12.5 per cent.

The duration of life after the appearance of the first symptom and after the commencement of treatment is in case of patients who die of cancer, much longer after the combined therapy than after surgical treatment. Patients only operated on have lived on an average thirty-nine months after the appearance of the first symptom and twenty-three months after the first treatment, the cases treated postoperatively forty-nine and thirty-one months respectively, the preoperative cases sixty-one and forty-one months and the endothermia cases sixty-seven and thirty-seven months respectively. Patients with cancer of the breast who are not treated live an average of thirty-one months after the appearance of the first symptom.—*Audrey G. Morgan.*

KOLTA, ERWIN, and DUNAY, BEATRIX. Die neuere Strahlenbehandlung der Magengeschwüre. (The newer radiation therapy of gastric ulcers.) *Klin. Wchnschr.*, June 11, 1929, *8*, 1125–1127.

Ten cases of gastric ulcers were treated by irradiating regions distant from the stomach, especially the anterior and posterior aspects of both thighs (field 15×15 cm., $\frac{3}{4}$ S.U.D., with 3 mm. Al, in 4 consecutive days, the series being repeated at intervals of 4, 8 and 12 weeks). The acid-alkaline balance of the blood and urine was determined previous and subsequent to every irradiation. It was found that a shifting towards the alkaline side of the reaction of the blood resulted after every exposure, later leading to permanent reestablishment of the normal balance. Of the 10 patients treated, in 6 there was complete healing both as regards the reestablishment of the normal acid-alkaline balance and the roentgen visualization of the ulcer, in 3 there was subjective improvement but the niches failed to disappear and in one there was deterioration. Five of the cases are briefly described and their laboratory data presented. It is interesting to observe that all patients kept their usual diet and were able to go about their occupations during the period of the treatment.

The conclusion is reached that irradiation of distant parts of the body may lead to a healing of gastric ulcers through a shifting of the acid-alkaline balance of the blood towards the alkaline side.—*T. Leucutia.*

BAGDASAROFF, A., and KOPELMANN, S. Zur Röntgenbehandlung der Magenerkrankungen. (The roentgen treatment of gastric affections.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, March, 1930, *41*, 434–442.

Nineteen cases of gastric conditions were treated by roentgen rays, 11 of which were gastric and duodenal ulcers, 5 simple gastritis with moderate or severe hyperacidity and 3 achylia and gastritis with anacidity.

The technique used was as follows: Neo-Intensiv apparatus, Coolidge tube, 180 kv.,

4 ma., field 10×15 cm., 30 cm. focus distance, 1.5 mm. Cu, 1 mm. Al, $\frac{1}{6}$ s.u.d. (2H) in the region of the stomach, given alternatingly over the front and back at two to four days' intervals. The series consisted of three seances and was in the majority of the cases repeated within three to five weeks.

The cases with gastric and duodenal ulcers responded favorably to radiation both as regards the subjective and objective symptoms. Only 2 cases with very marked adhesions remained uninfluenced. There was also improvement in the cases of simple gastritis with hyperacidity but all cases of achylia and of gastritis with anacidity remained recalcitrant to the treatment.

The authors investigated the changes in the acid-alkaline balance of the blood and in the reaction of the sympathetic system during the course of the treatment and they found that there was a parallelism between the shifting of the acid-alkaline balance of the blood towards the alkaline side and of the tonus of the vegetative system towards amphotonia (while previously there was vagotonia). This in their estimation indicates that the effect of the roentgen rays is chiefly through the sympathetic system.—*T. Leucutia.*

Stuhl, L. Guérison par la radiothérapie de deux cas d'actinomycose cervicofaciale. (Healing with roentgen therapy of two cases of cervico-facial actinomycosis.) *Bull. et mém. Soc. de radiol. méd. de France*, May, 1930, *18*, 210–214.

The author successfully treated 2 cases of actinomycosis of the neck and face with the combined method of iodine and roentgen therapy. The iodine was administered in the form of Lugol's solution in doses of one tablespoonful three times a day, while the roentgen therapy was carried out with weekly doses of 250 r (25 cm. spark gap, 6/10 mm. Al filter, 30 cm. skin target distance), for a total of from 1500 to 2500 r. A complete healing resulted. The opinion is expressed that the roentgen-iodine treatment is the method of choice.—*T. Leucutia.*

Desplats and Langeron. L'irradiation des régions surrénales dans la vasoconstriction et dans la vasodilatation des extrémites. (Irradiation of the suprarenal regions in vasoconstriction and vasodilatation of the extremities.) *Bull. et mém. soc. de radiol. méd. de France*, Jan., 1930, *18*, 39–44.

The authors report additional cases of arterial claudication treated by irradiation of the suprarenal region with satisfactory results. The conclusion is reached (1) that roentgen therapy of the suprarenal region produces an immediate relief of pain, with disappearance of the trophic changes, and a reëstablishment of normal vascular reflexes in arteritis obliterans and the vasoconstriction syndrome; (2) that roentgen therapy likewise produces a relief of pain in the syndrome of vasodilatation, and (3) that the mechanism of this action, difficult to explain, is most probably through reëstablishment of the equilibrium of vasomotor regulation.—*T. Leucutia.*

Laborde, Simone. Résumé des travaux de la sous-commission chargée de l'étude de la radiothérapie du cancer du col de l'utérus. (Résumé of the work of the subcommittee charged with the study of radiotherapy of cancer of the uterine cervix.) *J. de radiol. et d'électrol.*, Feb., 1930, *14*, 96–100.

The cancer committee of the League of Nations has created a subcommittee for the study of the radi therapeutic procedures in cancer of the uterus. Among the members of the subcommittee, Heyman, Lacassagne and Voltz have published individually the technique and results in the radiotherapy of cervical uterine cancers (Radiumhemmet of Stockholm, Curie Foundation of Paris and Universitäts Frauenklinik of Munich).

Regaud, the president of the subcommittee, has summarized the work of the organization in a detailed report. The salient points of this report are briefly reviewed in this article. They comprise: (1) the classification of the various forms of utero-cervical epitheliomas; (2) the division of the epitheliomas of the cervix into different stages according to their anatomical extension; (3) establishment of certain standards for the publication of therapeutic results, and (4) the general principles of the therapeutic procedures.

The classification of the epitheliomas of the cervix into four stages according to the anatomical extension is discussed and the results obtained at the above three institutions are given.—*T. Leucutia.*

Fukase, Shuichi. Über die Beeinflussung der Frakturheilung durch Röntgenstrahlen.

(The influence of roentgen rays on healing of fractures.) *Fortschr. a. d. Geb. d. Röntgenstrahlen*, April, 1930, *41*, 581–588.

The author investigated the effect of roentgen rays on callus production by irradiating fractured fibulae (in their upper thirds) of rabbits. Eighty-four animals were used for the purpose of experimentation, and the irradiation was carried out with the following technique: 170 kv., 30 cm. distance., 0.5 mm. Zn filter, a 14 min. exposure corresponding to 8 H (400 R) or 75 per cent S.U.D. In one series the irradiation was carried out with fractional doses, 8 H being given on four consecutive days (total 32 H). In a second series one single dose of 8 H (400 R) was given, while in a third series the dose was reduced to half. The control examinations were carried out by means of roentgenograms, macroscopic inspection of the fractured bones and by means of microscopic sections.

It was found that an increased quantity of callus does not necessarily imply a callus of good quality, in fact, the two are often antagonistic; a large amount of callus may result in delayed healing, while a small amount of callus but of good quality, may hasten the healing.

The effect of the various doses was as follows: (1) Large roentgen doses produced first an entire lack (lasting for a period of two weeks), and thereafter an increased amount of callus formation, the healing as a whole being delayed. (2) The moderate doses led to a decrease in the quantity but to increase in the quality of callus, as a whole accelerating the healing. (3) In small doses there was no noticeable effect.—*T. Leucutia.*

TABERN, D. L., HANSEN, N. A., VOLWILER, E. H., and CRANDALL, L. A. A study of the halogenated oils employed in roentgenology. *Radiology*, April, 1930, *14*, 364–371.

For several years iodized oils have been employed to great advantage for the roentgenographic and roentgenoscopic visualization of certain body cavities. The iodized oils, however, are unstable toward heat, light and moisture; the iodine or iodides subsequently always liberated in the body may, over long periods of time, cause toxemia, irritation, or iodism; their cost is considerable, and their viscosity is so high that they are frequently ill suited for the particular purpose. Accordingly, the authors have undertaken the development and study of brominized oils and esters as substitutes for the iodine mixtures. Two products have been found to possess the most desirable properties. The first was 33 per cent brominized olive oil esters (viscosity 7 sec.) and the second a mixture of 85 per cent brominized olive oil and 15 per cent of brominized olive esters (viscosity 120 sec.). For filling nasal accessory sinuses the brominized olive esters are preferable; filling is rapid and complete and the time of drainage is reduced by many hours. The ester product is also superior for visualization of the seminal vesicles and has been used successfully for pyelography. It was introduced into the uterus and fallopian tubes and little pressure was necessary, but the tubal shadows were less distinct than with oils of higher viscosity. For visualization of the bronchial system, the second mixture is preferable. The brominized oils and esters are more stable than the iodized oils, have controllable viscosities without loss of radiopacity, are economical to manufacture and use, low in toxicity, and, of course, cannot cause iodism.—*J. D. Camp.*